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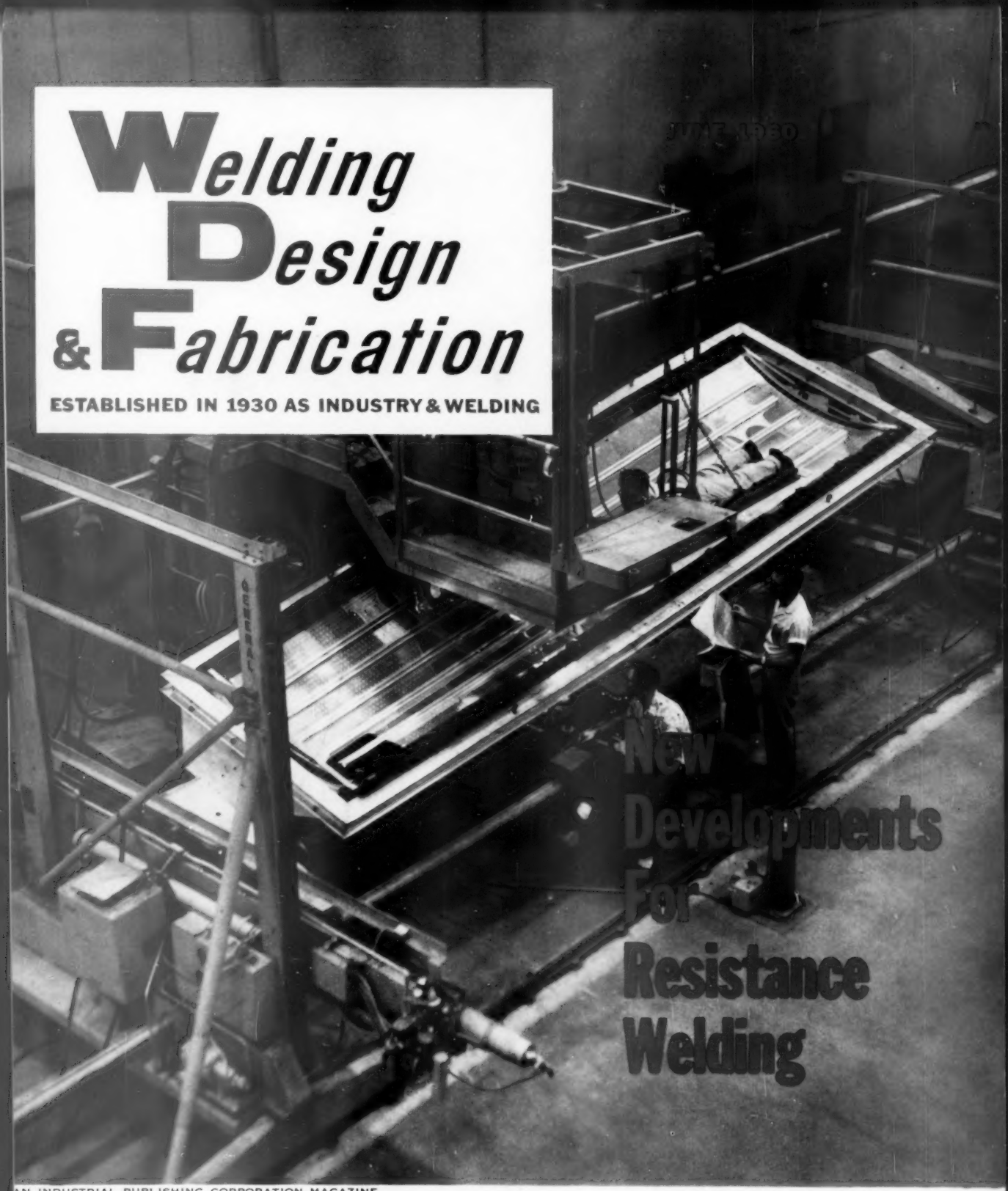

New Developments For Resistance Welding

AN INDUSTRIAL PUBLISHING CORPORATION MAGAZINE

ALSO IN THIS ISSUE

HIGHLIGHTS OF A.W.S. CONVENTION AND WELDING SHOW

TECHNIQUES FOR ARC WELDING MOLYBDENUM

IN-MOTION X-RAY SPEEDS INSPECTION OF WELDED TANKS

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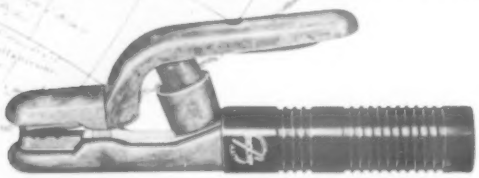
Capacity: 1/4" rods at 300 amps. (weighs only 15 3/4 oz.)



Jackson Model A-W, *lightest medium-class holder.*
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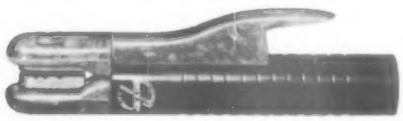

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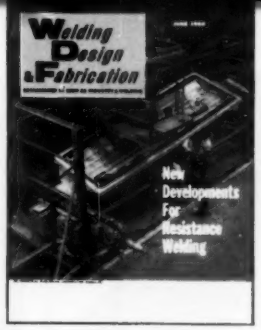

for June, 1960

COVER: Ryan Aeronautical Co., San Diego, uses punched-tape control system in spot welding large panels for Boeing's KC-135 jet tanker-transport plane. The punched-tape system positions the work under the welding electrodes. Actual firing of the weld is done manually. The tape moves large double-contoured jigs into position under the welding heads. A sensing unit keeps work exactly at proper weld spot and exactly horizontal.

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Production line welding and angle space frame construction is the most economical and practical way to get desired architectural effects.

45 BETTER HYDRAULICS LINES HAVE BRAZED FITTINGS
Connections in hydraulic lines are no longer potential leakers; brazing (resistance and induction) is making strong, reliable joints.

46 GOOD MACHINE DESIGN SAVES $1,600, TAKES 25% LESS SPACE
New welded milling machine wins a design award; it takes less time to make, needs less space, and performs better.

50 HOW TO WELD MOLYBDENUM
Arc welding of this jet-age metal is discussed in the second of a series of three articles. Next month: Resistance welding.

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56 WELDED ELEVATOR ENGINES ARE BUILT TO TAKE IT
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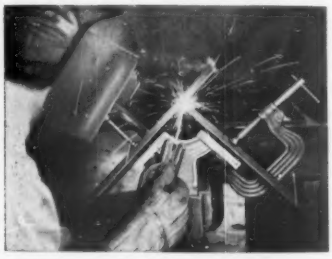

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PAGE also supplies a complete range of metal spray wire, bare and sulcoated electrodes, and gas welding rods. Regardless of *your* welding requirements, PAGE can furnish the *right* wire—with the size, temper, finish and uniformity you need.

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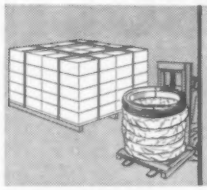
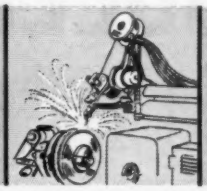
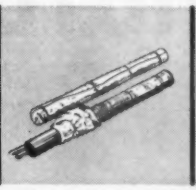


25-lb. or 60-lb. coils, single or palletized—also in single or palletized individual cartons, or in waterproof reusable fiber-board drums.

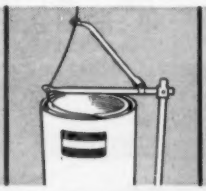
120-lb. or 180-lb. coils, paper-and-burlap wrapped, or in palletized cartons. Special coil sizes on application.



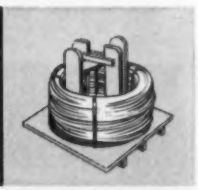
25-lb. reels (spools) in cartons are designed to fit all standard machines; single or palletized to meet your requirements.



Gas welding rods in 50-lb. paper-and-burlap bundles; in fiber-board cartons of 10 lb.; and in boxes of 50 lb. or over.



Payoffpaks and Leverpaks are furnished with diameters ranging from 15" to 23" and capacities from 250 lb. to 700 lb.



Payoffpallets hold 900-1200 lb. of wire (sizes 3/16" to 3/8" incl.) coiled around pedestal on top of a wooden pallet.

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PAGE welding wires, rods and electrodes are as near as your phone. Prompt delivery is assured from a coast-to-coast network of PAGE distributors, backed by a nationwide system of strategically located warehouses. At all times, PAGE welding specialists are ready to give expert advice.

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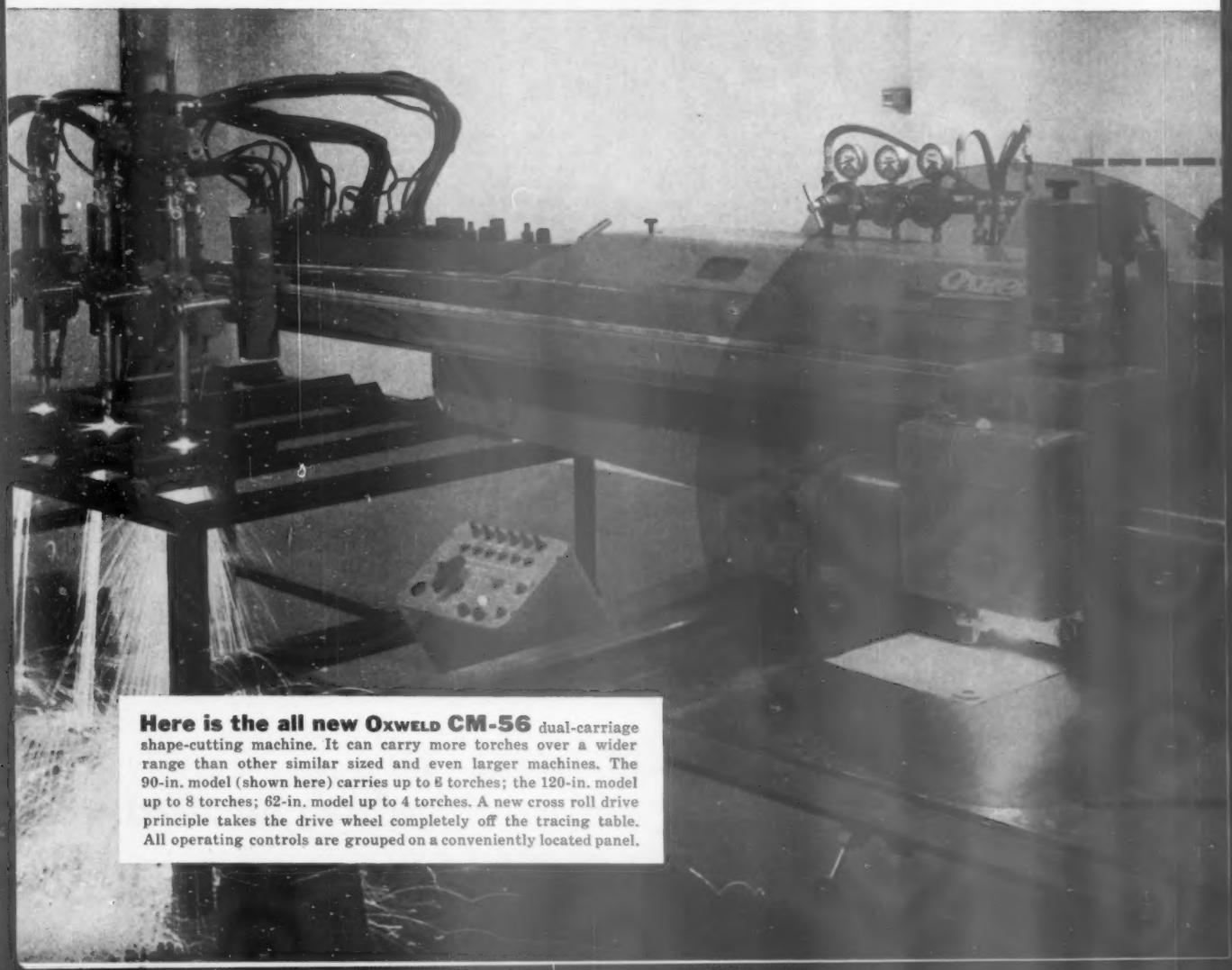


Here is the all new OXWELD CM-56 dual-carriage shape-cutting machine. It can carry more torches over a wider range than other similar sized and even larger machines. The 90-in. model (shown here) carries up to 8 torches; the 120-in. model up to 8 torches; 62-in. model up to 4 torches. A new cross roll drive principle takes the drive wheel completely off the tracing table. All operating controls are grouped on a conveniently located panel.

with built-in kerf adjustment!

Exact size pencil drawings of the most intricate shapes and forms can now be used to guide oxygen shape-cutting machines! Using easy-to-prepare pencil or ink drawings on ordinary paper, you entirely eliminate expensive and bulky templates, photographic negatives and costly silhouettes. And there is no template storage problem. In most shops, savings from the elimination of templates alone will pay for the new tracer in less than a year.

Extreme Accuracy—Tracer accuracy is excellent—within ±0.005 inch. Kerf widths up to ¼ in. are adjusted for on the tracer. Drawings of parts are made in the *exact size* of the piece desired. They can even be traced directly from engineering drawings! With LINDE's unique kerf adjustment, one simple line drawing can be used to reproduce the same shape in different plate thicknesses.

Speed is controlled by an efficient eddy-current governor that provides smooth, stepless speed control over a range adjustable from 2 to 30 in. per minute. The tracer can negotiate 90° turns with 1/16″ radius at average cutting speeds. Models of the new tracer are available for use with all OXWELD machines and most competitive machines.

Tracer not affected by ambient light—The Tracer may be located indoors or outdoors without regard for lighting conditions. Ordinary light or sunlight does not interfere with the precision operation of the tracer. An operator can use as much light as he needs to follow the cutting operation without fear of upsetting the cutting pattern. He can steer manually or use remote control buttons.

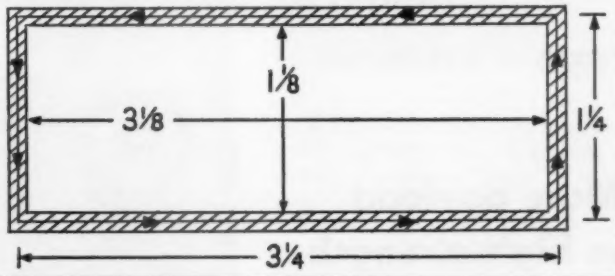
Get full details on the new LINDE Photocell Tracer and the OXWELD CM-56 shape-cutting machine from your local LINDE office. Or, write Linde Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. In Canada: Linde Company, Division of Union Carbide Canada Limited, Toronto.

LINDE COMPANY UNION CARBIDE

WHAT KERF ADJUSTMENT MEANS TO YOU:

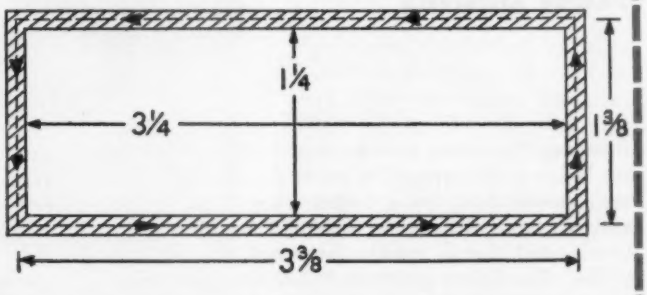
Cutting without kerf adjustment

Path of torch guided by a tracer without kerf adjustment following a 1¼″ by 3¼″ drawing. Assuming the kerf width is ⅛″ the actual part produced measures only 1⅛″ by 3⅛″ even though the torch (arrows) faithfully follows 1¼″ by 3¼″ drawing.



Cutting with kerf adjustment

Path of a torch guided by LINDE Photocell Tracer with kerf adjustment following a 1¼″ by 3¼″ drawing. With the kerf adjustment set for the ⅛″ kerf the torch (arrows) will follow a path 1/16″ around the outside of the 1¼″ by 3¼″ drawing of the part. Actual shape produced measures 1¼″ by 3¼″—exactly the same as the drawing.



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WELDING AT WORK

to do the job better and cheaper

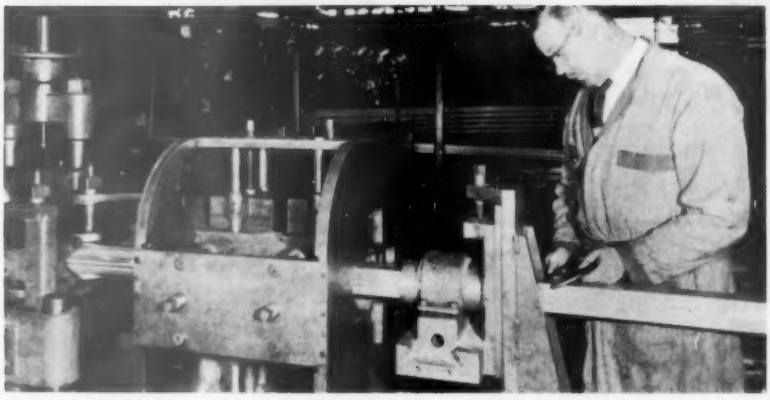
Portable x-ray inspects atom plant

ROWE, MASS.: Portable x-ray has played a vital role in the inspection of critical and exacting weldments used in the construction of the 134,000 kw Yankee Atomic Electric Company plant. Chicago Bridge & Iron Company, builder of the big, unique weldments going into the plant, used Balteau Electric x-ray machines because they were reliable, compact, easy to handle, and rugged. Baltospot 200 and Baltograph 260 units were used where 100 percent inspection was required. Where spot x-ray sufficed, the small Baltospot 140 was used. The principal weldments: a 125-foot sphere, and a 6- by 8-foot core in a 9- by 30-foot pressure vessel.

More payload in high-strength steel bodies

READING, PA.: State laws limiting truck weights led the Moore Body Company to search for ways to lighten their custom dump truck bodies. They found the answer in Jones & Laughlin Jalten—a low-alloy high-tensile steel that is readily fabricated, formed, and welded. The lighter gages used eliminated 25 percent of the deadweight from the dumper bodies, and raised the all-important payload by that much. One of Moore's largest models, a trailer-dumper with a 50-yard capacity, has Jalten side panels, braces, front end, and tail gate. Smaller models have Jalten floors too.

Besides weighing less, the high-strength steel resists corrosion, abrasion, and impact damage. These count considering that most dump bodies are used to haul wet sand, gravel, dirt, rocks, coal, metal turnings, and other materials which cut and scrape against the body as it is loaded and dumped.

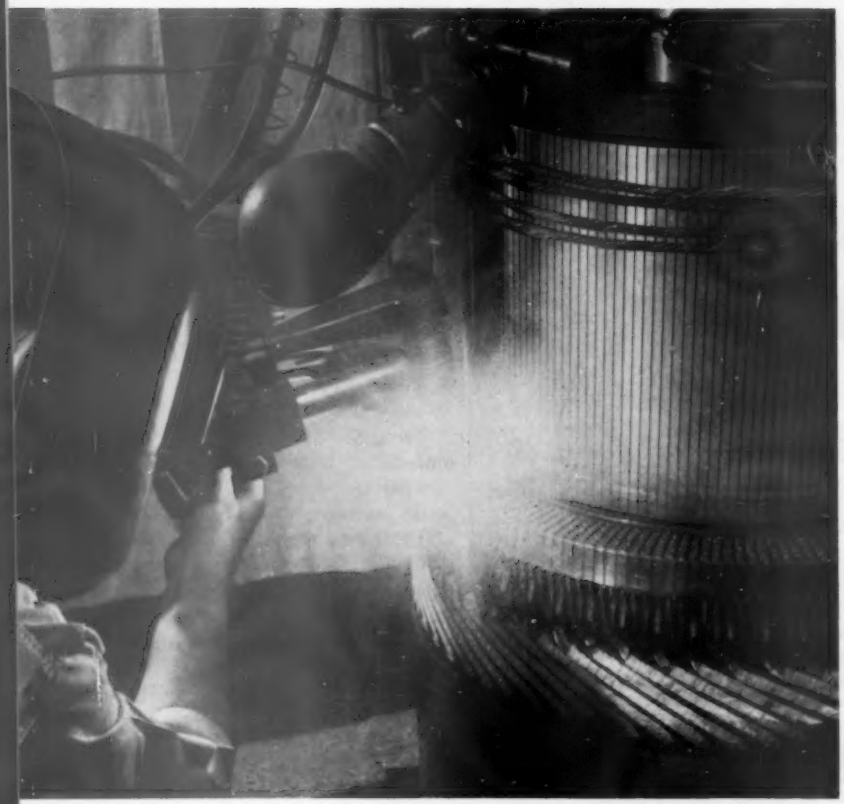


Welded tubing suits reactor tolerances

MONROE, MICHIGAN: Engineers of Atomic Power Development Associates designing the new fast breeder reactor of the Enrico Fermi atomic power plant needed unusually close tolerance square tubing for fuel core subassemblies. They also needed a tubing material that would withstand a heat transfer medium of liquid sodium at 900F and 100 psi flowing over the uranium pins.

They settled on Standard Tube Company's Type 347 welded tubing; welded, because dimensions could be closely held; 347, to handle the hot liquid sodium.

Top photo shows cross-sectional model of reactor core tube with 144 fuel pins. Bottom photo shows one of Standard's processing operations: turkshead shaping of round-into-square welded tubing.



All-copper welds to replace solder in locomotive motors

ERIE, PA.: The tungsten inert gas arc welding process will soon be used to connect commutator risers to armature coils at General Electric Company's Locomotive and Car Equipment Department. This will be the first time all-copper welds have been used on industrial locomotive motors and generators.

There are distinct advantages: Much better protection against overload, high temperatures, and dirt. With soldering, the old way, overloading melted the solder and threw it. Even high-temperature solders and brazing has not worked out. And regular solders are weak at high heats.

The copper welds remain strong at high temperatures, they won't throw, and, as a result, closed binding can be used. This stops dirt and moisture.

for low-cost . . . heavy-duty

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SANDER GRINDERS. 3 models . . . 7 or 9 inch discs. 5000 RPM. For sanding metal or wood; grinding down welds and casting ridges; cleaning structural steel, tanks, boilers, vats, sheet metal, cutting casting risers and dressing down joints.

Available with either safety reinforced grinding discs or highly flexible cool running MILWAUKEE Exclusive nested spring steel backing pads and spiral abrasive sanding discs. Readily adaptable too for use with cup-type grinding wheels and wire brushes to meet specific job needs.

AERIAL GRINDERS. 3 models . . . 4", 5" and 6" wheel diameters . . . 4000 to 5550 RPM. For preparation of surfaces for welding, to smooth off welds, snag and grind castings, remove rust, scale and old paint, and general cleaning and buffing.

For a convincing demonstration see your nearby Milwaukee Electric Tool Distributor . . . or write

MILWAUKEE ELECTRIC TOOL CORP.

5318 W. STATE ST. • MILWAUKEE 8, WIS.

For More Information Circle No. 65 on Reader Service Card.

FORTY FEET UP and 90 to go . . .

AQUATORE grew with jacks and plate rings.

135-foot tower is built from the top down

SCHERERVILLE, IND.: The first water tower to be built from the top down was designed and constructed here by Graver Tank & Mfg. Co., a Division of Union Tank Car Co. The 250,000 gallon tank, called Aquatore, is unusual in design, and in the way it was put up.

First, the 51-foot diameter doughnut-shaped tank was assembled and welded on the ground. The shop-cut plate segments used were 5/16 and 7/16 inches thick. Then, by means of a series of hydraulic cylinders spaced around the base of the first column section, the tank was jacked up and rolled-plate sections fitted and welded. This was repeated until 16 column rings were fitted and welded. The overall height of the tower was 135 feet. Column plate thicknesses were ½ and 9/16 inches.

Pipeline won't corrode, spark, or need paint

BATON ROUGE, LA.: When they dug up the old steel pipe bringing natural gas to Kaiser Aluminum & Chemical Corporation's alumina plant, it was badly corroded. This won't happen again. The new line is made of Kaiser's 6061-T6 aluminum alloy, as were the welding fittings and flanges forged by Tube Turns. Over 1,600 feet of seamless pipe, 4 to 14 inches in diameter, was used.

In fabricating the line, the contractor, H. E. Wiese, Inc., used tungsten-inert-arc welding for close-quarter work, metal-inert-gas welding where the work was easy to reach.

Besides being corrosion resistant, the smooth, lightweight aluminum pipe was easy to install, will permit better gas flow, and it won't spark. Also, it won't have to be painted.

Hackney MILWAUKEE

high pressure cylinders are...

SMOOTH-SURFACED

- Cut maintenance costs—uniform surfaces clean easily, paint quickly.
- Have eye appeal—no crevices, cracks or ridges. Modern appearance for industrial and medical applications.

UNIFORM...DURABLE

- Every size has uniform capacity, controlled weight—filling, handling and record-keeping are simpler.
- Ruggedly constructed for long life. Hackney has spelled durability and quality workmanship since 1902. Every cylinder exceeds ICC specifications.

QUALITY-BUILT

- Hackney quality costs no more. And it gives you extra features such as accurate threading, neater appearance and legible stamping.
- Available in a complete range of sizes and shapes to meet any gas requirement—from small medicals to 220's, 250's and 300's (cu. ft.).

Economical, strong, safe Hackney cylinders meet your needs for every type of industrial gas. Central location means faster shipping with lower freight charges. Your nearest Hackney representative will be glad to give you complete specifications and quote prices.

Pressed Steel Tank Company

Manufacturer of Hackney Products Since 1902

1473 South 66th Street, Milwaukee 14, Wisconsin

Branch Offices

Clifton, N. J. · Atlanta, Ga. · Orlando, Fla. · Columbus, O. · Chicago, Ill. · St. Louis, Mo. · Marshfield, Mass. · Downingtown, Pa. · Detroit, Mich. · Los Angeles, Calif.

CONTAINERS AND PRESSURE VESSELS FOR GASES, LIQUIDS AND SOLIDS

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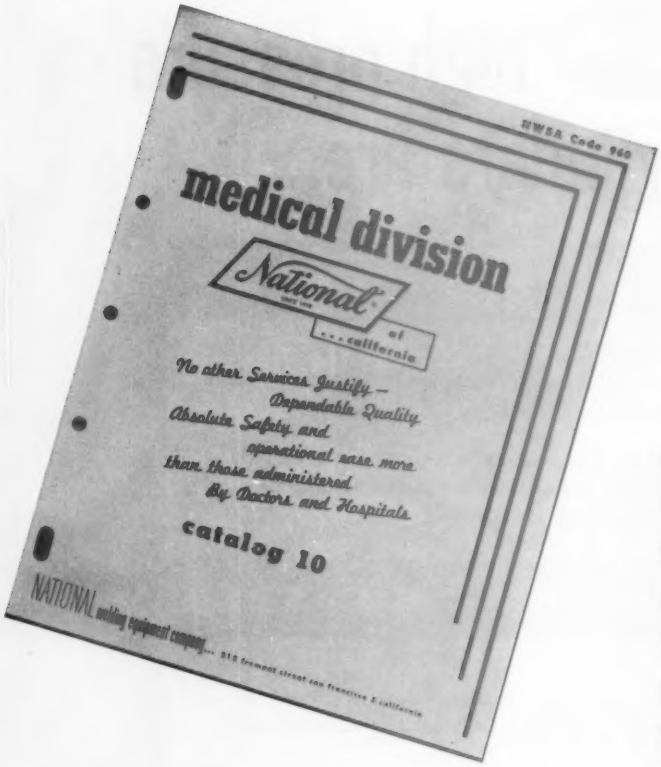


Just off the press—a new, twenty page catalog #10, illustrating and describing some of the products of our MEDICAL DIVISION. Write for it today.

IF YOU SERVE HOSPITALS, AMBULANCE COMPANIES AND PATIENTS IN PRIVATE HOMES WITH OXYGEN and other medical gases THE ITEMS ILLUSTRATED AND DESCRIBED IN OUR NEW CATALOG #10 WILL INTEREST YOU...

For over 50 years our company has been engaged in using, designing and manufacturing fine quality products used in connection with high pressure gases for industry and the medical fields.

Our regulators, both the single and the two stage reduction models, may be found in the majority of all leading hospitals, from coast to coast.

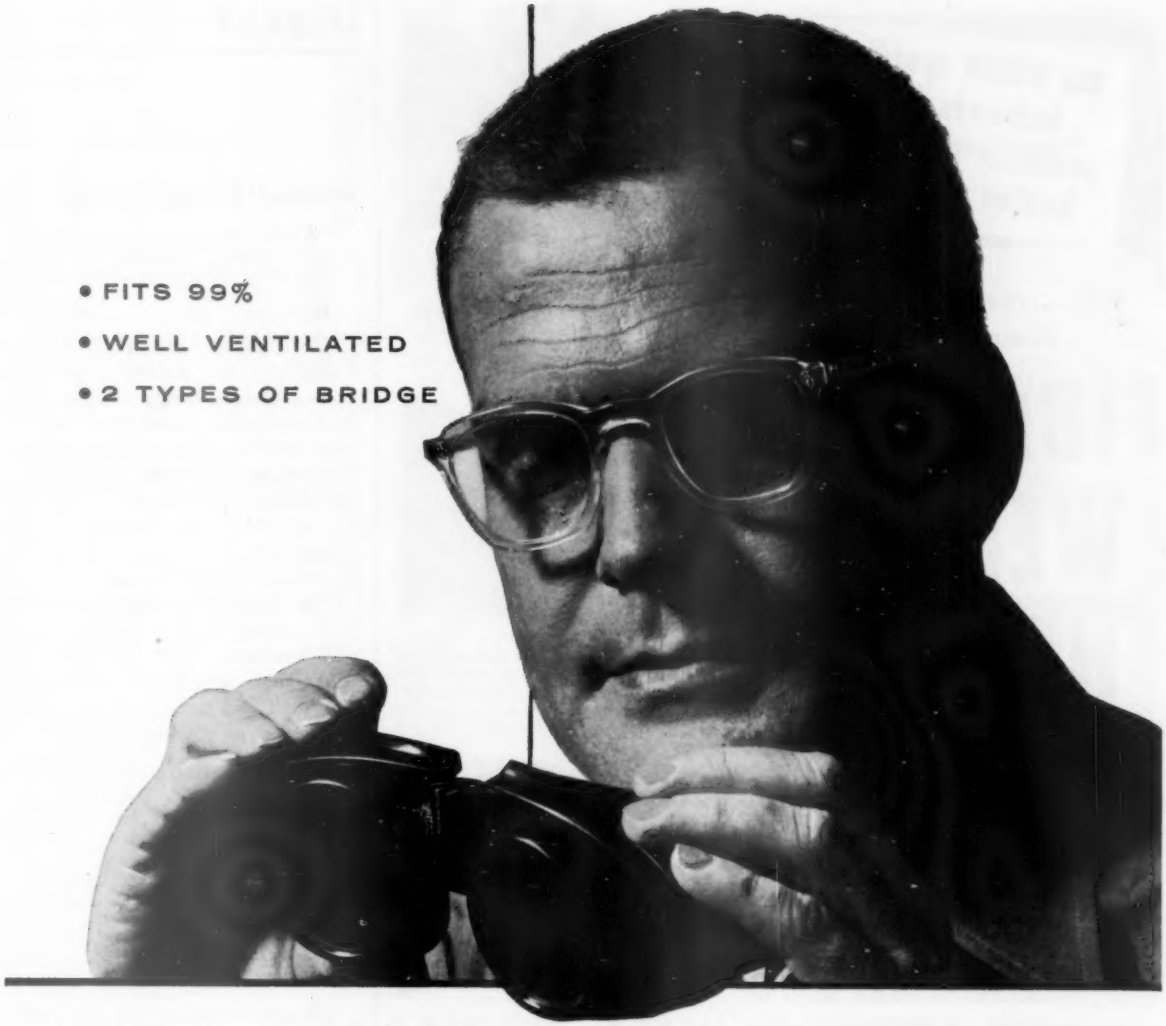
In this new catalog we illustrate and describe a very complete line of regulators, flowmeters, portable oxygen units, humidifiers, yoke needle valves (with and without cylinder pressure gauge), hospital piping equipment, masks and cannulas, various types of tubings, cylinder bases, cylinder trucks and general fittings required, yokes, adapters, transfillers, gauges and the many items the reseller needs to offer complete service to hospitals.

Our products are well known for their dependability and long service life and we cordially invite you to write for this new catalog and ask for distributor advantages. We have devoted our entire skill and know-how to the production of fine equipment to serve the distributor as well as his customers. We do not manufacture gases.

NATIONAL welding equipment company... 218 fremont street san francisco 5 california

553 DEPT.

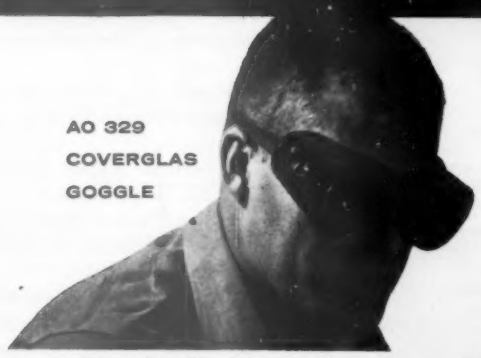
For More Information Circle No. 68 on Reader Service Card.



This is the New AO Coverglas Goggle that Fits Practically Every Welder

BE SURE TO SEE IT!

American Optical
COMPANY
SAFETY PRODUCTS DIVISION
SOUTHBRIDGE, MASSACHUSETTS
Safety Service Centers in Principal Cities



QUICK FACTS

- Accommodates every type of personal glasses.
- 50mm. round lenses (Filterweld Nos. 3, 4, 5 and 6 shades standard).
- Adjustable leather bridge. Also available with rigid bar bridge as 329B.
- Opaque black, cellulose acetate eyecups.
- Companion chippers' model (325) has direct ventilation and clear Super Armorplate lenses.
- Your nearest AO Safety Products Representative can supply you.

Be Safe For Sure . . . With AO SURE-GUARD Goggles

For More Information Circle No. 6 on Reader Service Card.

Do YOUR welding helmets help produce more and better welding?

YES!...they do if they're Fibre-Metal's

FIBERGLAS* WELDING HELMETS

Undeniable comfort, clearest wide vision and assured safety are basic quality features of these Fiberglas welding helmets. FIBRE-METAL compression-molded, Fiberglas-reinforced polyester resin shells offer the very finest in durable face protection. Proper glass fiber distribution and a "beaded edge for strength" insure long-lasting, trouble-free helmet life. Shells are self-extinguishing, are unaffected by heat and moisture, will not warp or lose shape, may be easily and quickly cleaned and sterilized. *Welders TELL US these helmets help produce more and better welding!*

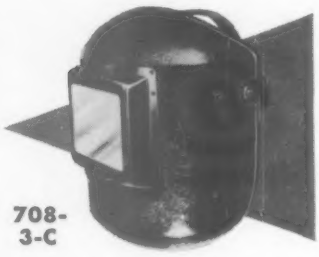
All helmets have Ratchet Adjustment "free floating" Headgear, impact resistant adjustable friction joints and adjustable chin rest. Glassholders are available in plastic, steel or Dowmetal, in either fixed or lift-front styles. All types of helmets are described in Catalog No. 26.

Ask your Welding & Safety Distributor!

*OWENS-CORNING TRADE MARK

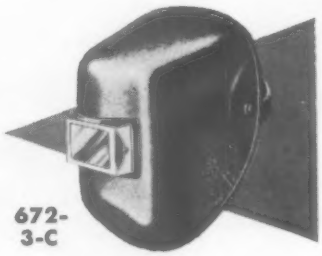
702-3-C

This is a popular standard-size Helmet that offers excellent fume and light seal with extra ventilation. Has all the famous Fibre-Metal comfort features. Offers variety of fixed and lift-front glassholders.



708-3-C

Over 120% increased vision with its 4½" x 5¼" lens...more vision both vertically and horizontally. Reduces eyestrain and fatigue. Excellent for welders who must wear bifocals, or trifocals, while welding.



672-3-C

The popular narrow-front shell for compact, lightweight protection. Best for welding in tight spots...eliminates flat, spatter-collecting surfaces. Less pitting, lasts longer. 674-3-C has lift-front glassholder.

606-3-C

Features extended neck and chest protection with greater ventilation. Standard-size shell. Also available with an Inner Bib *(See our Catalog No. 26)* for extra fume and light seal.

The FIBRE-METAL Products Company | CHESTER PENNA

In CANADA: Fibre-Metal (Canada) Limited, Toronto

For More Information Circle No. 33 on Reader Service Card.

LIBRARY

of welding

Welded Bridge Design

"Welded Interstate Highway Bridges" edited by James G. Clark. Published by The James Lincoln Arc Welding Foundation, Cleveland, Ohio; 269 pages; $2.00.

The James F. Lincoln Arc Welding Foundation has published this new book of welded bridge designs which reviews current practice on the Defense and Interstate Highway System. The designs, reviewed with written discussions and drawings abstracted by the editor, are presented in sufficient detail to cover all of the significant aspects of each.

The types of designs reviewed include examples of continuous, simple and cantilever plate girders; two-hinge and three-hinge arches; conventional and ortho-tropic plate box girders; double leaves bascule.

ASTM Standards Supplements

"1959 Supplements to Book of ASTM Standards" published by the American Society for Testing Materials, 1916 Race St., Philadelphia; 10 parts; $4.00 per part; $40.00 per set.

The American Society for Testing Materials has announced that the 1959 Supplements to their 1958 book of ASTM Standards have been completed. The 1959 Supplements give in their latest form standard specifications, tests, definitions, and recommended practices which are being issued for the first time or have been revised since their appearance in the 1958 Book of Standards.

The Book is published triennially with supplements in the intervening years.

The three parts of greatest interest to welding and metalworking people are:

Part 1: Ferrous Metals Specifications, 362 pp., 58 standards.

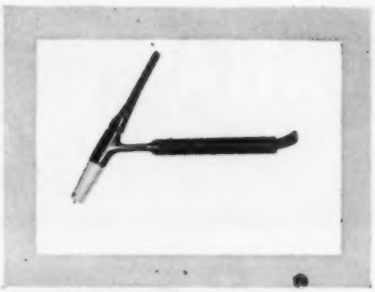
Part 2: Non-Ferrous Metals Specifications and Electronic Materials, 280 pp. 38 standards.

Part 3: Methods of Testing Metals (Except Chemical Analysis)—110 pp., 14 standards.

continued on page 16

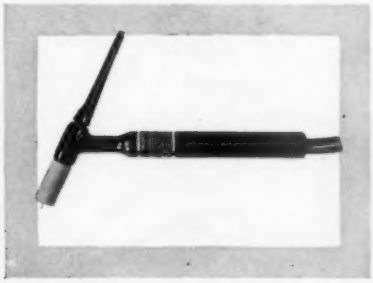
HW-9 110 amp., Air cooled. Weighs only 3 oz. Interchangeable collet body and torch cap provide 120° or 60° working angles for torch head. Screw-on connections for cable and hoses. AC or DC. Self-aligning electrodes. Electrode sizes: .020 to 1/16 in.

HW-9 110 amp. Pencil torch. Air cooled. For welding thin gauge materials. In-line design for welding in hard-to-reach joints. Handle is high impact phenolic tube over bronze torch body. AC or DC. Self-aligning electrodes. Electrode sizes: .020 to 1/16 in.

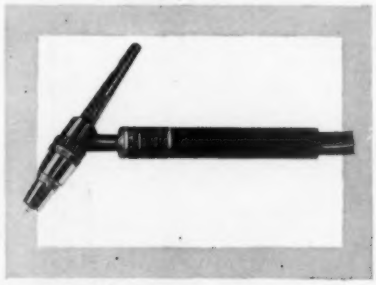


HW-17 130 amps. AC or DC. Highest rated air cooled manual torch available. Self-aligning electrodes. Design eliminates high-frequency leaks. Collets, collet bodies, caps and cups interchangeable with HW-18. Electrode sizes: .020 to 3/32 in.

HW-20 200 amps. AC or DC. Water cooled. Weighs only 3.3 oz. This small-size torch can actually weld inside a 3-in. tube. No chance of water leaks (same design as HW-18). Self-aligning electrodes. Electrode sizes: .020 through 1/8 in.



HW-18 300 amps. AC or DC. Water cooled. Torch body is molded around water passages to form closed cooling system—no chance of leakage. Improved collet bodies for better shielding with less gas. Torch designed for welding metals with a wide range of thicknesses. Self-aligning electrodes. Electrode sizes: .020 to 1/8 in.



HW-12 500 amps. AC or DC. Water cooled. For heavy-duty manual welding. Includes two collet bodies, one from 10 to 300 amps., the other, 300 to 500. Straight-line water passages are easily cleaned. Entire torch quickly disassembled. Electrode sizes: .040 through 1/4 in.

LINDE'S BALANCED LINE OF TORCHES FOR "HELIARC" WELDING

Weld these metals the easy way: with one of Linde's Balanced Torches

aluminum	"Everdur"	nickel
brass	galvanized steel	phosphor bronze
cast iron	HASTELLOY	silicon bronze
copper	lead	stainless steel
copper-nickel	magnesium	titanium

ASK YOUR LINDE DISTRIBUTOR or write Dept. WDF-06, Linde Company, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. *In Canada:* Linde Company, Division of Union Carbide Canada Limited, Toronto.

LINDE COMPANY

UNION CARBIDE

"Hastelloy," "Linde," "Heliarc," and "Union Carbide" are registered trade marks of Union Carbide Corporation.

For More Information Circle No. 55 on Reader Service Card.

ATLAS | WIDE - BLADE TOMAHAWKS

WORLDS LEADING WELD CLEANING TOOLS

NEW! "SUPER" TOMAHAWK

Get these SUPER features in new SUPER!

1. Redistribution of weight—The weight's in the head for more production with less effort.

2. New light weight, tempered aircraft aluminum shaft. Unbendable — unbreakable. Can't turn or come loose.

3. New Atlas "wide-blade" design. Wider chipping edge further increases chipping speed—adds to life of tool.

4. Formed hardwood grip that fits the hand. Locked on shaft so it can't turn or loosen.

Tough as they come!

33 MODELS

Each Atlas tool is made as well as we know how. Ask your welding supply dealer to show you the complete line.

ATLAS WELDING ACCESSORIES INCORPORATED
707 E. LEWISTON
FERNDALE 20, MICH.

For More Information Circle No. 13 on Reader Service Card.

continued from page 14

High Productivity In Heavy Engineering

By A. G. Thompson; published for "Welding & Metal Fabrication" by Iliffe & Sons Limited, Dorset House, Stamford Street, London SE 1, England; 8¾ by 5½ inches; 339 pages with 36 illustrations; 65 shillings net (by post 66s.3d.)

Production, inspection and cost control in welded fabrication are covered in this book. The first half covers the technology which has been built up around welded fabrication. The second half of the book is devoted to cost estimating and cost control methods appropriate to heavy fabrication.

Welding Handbook: Section III

Welding Handbook, Section III, Miscellaneous Metals Joining & Cutting Processes, edited by Arthur L. Phillips, cloth bound, 512 pages, published by the American Welding Society, 33 West 39th Street, New York 18, New York, Price: $9.00

Publication of the Third Section of the *Welding Handbook* is announced by the American Welding Society. The volume contains 335 illustrations, 78 tables, and a comprehensive index. Special welding and metal joining processes are covered, as well as arc cutting processes.

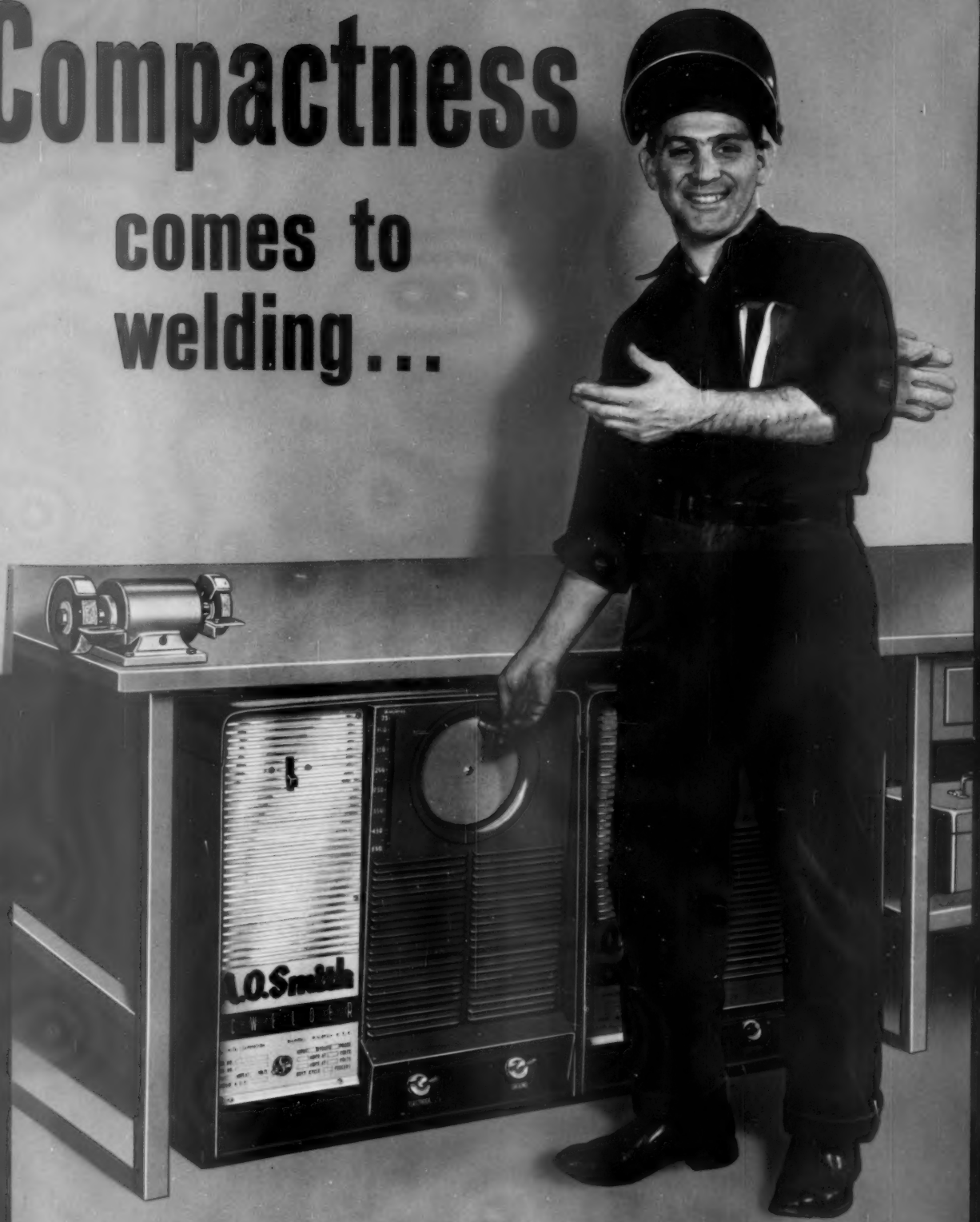
Recent developments, including adhesive bonding and the welding of plastics, are covered. Tabulated material from which standards could eventually be compiled are included.

Ultrasonic welding is another subject new to the Handbook. This is one of the newest welding processes to have commercial applications, since minimum pressure is required, no heat source needed, and a metallurgical bond is obtained without surface deformation.

Section III contains chapters on these subjects: forge welding, thermit welding, induction welding, surfacing, metallizing, brazing, soldering, welding of plastics, adhesive bonding of metals, oxygen cutting—auxiliary oxygen cutting processes, arc cutting, ultrasonic welding, welding by cold working, and stud welding.

Circle No. 78 on Reader Service Card. ⟶

Compactness comes to welding...



A. O. Smith's new MONARC line compacks more machine in a smaller package at a smaller price

400 AMP model shown—all models same size.

Compactness comes to welding...

Customized accessories available including D.C. conversion

A. O. Smith's new MONARC line

trims the waste from welding machines

No waste of space!

It stacks! It racks! It slides under a bench with the greatest of ease. Only 28 inches low . . . 24 inches wide . . . 30 inches deep—the **MonArc** fits where others take up valuable floor space. You release area for increased production — an important factor with industrial space cost averaging $10 a square foot. We achieved this compact design without compromising superior welding characteristics of the moving-coil machine by making coil movement lateral.

No waste of motion!

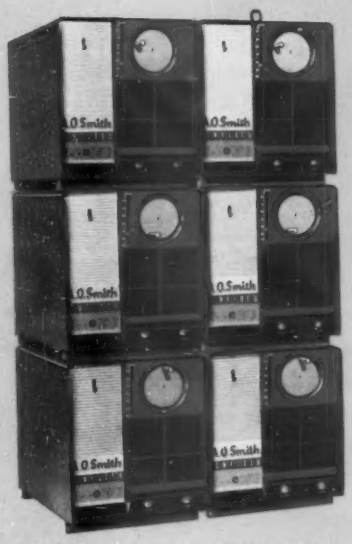
We made time and motion studies. We learned how to achieve compactness with no sacrifice in operational ease. For example, while the **MonArc** is a *foot lower* than conventional machines, the full-range, stepless current-control wheel is at convenient arm's length—higher than competitive models. We also cut down handwheel turns to 15 — fewer turns and easier turning than with any other standard characteristic welder in the market.

No waste of money!

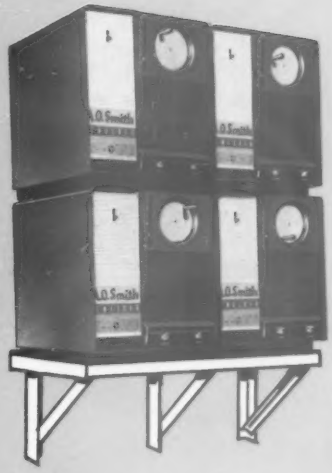
Superior in design. At an economical price, no other machine gives you so much for your money. But while you get more, you never get more than you want. The **MonArc** line consists of three basic machines (300, 400, 500 amp models). We customize this basic line with a selection of tailored accessories. You check off exactly what you need — no built-in "excessories" that add only cost to your operation.

No waste of time!

Our customized approach also saves on delivery time. You don't have to wait two or three weeks for delivery of a certain model from our home factory. Basic machines and customized accessories are stocked in warehouse centers and distributor houses enabling us to meet your requirements exactly . . . and meet them quickly.

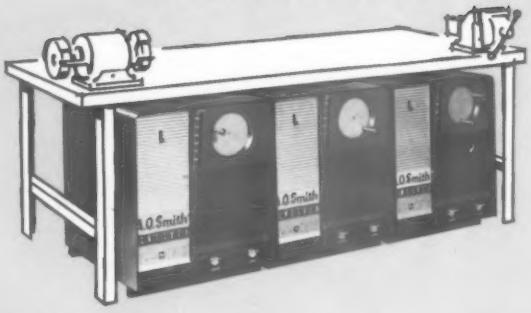


It stacks up to three high!



It racks!

It slides under a bench!



SEE HOW IT STACKS UP! The new MonArc line is on display at A. O. Smith welding equipment distributors everywhere.

SPECIFICATIONS

Series No.	Rated amperes at 40 volts	Input kw	Duty cycle	Primary amperes with PF correction		Primary amperes without PF correction		Power Factor*		Open-circuit volts	Welding range	Weight in pounds	Height	Width	Length
				230 volts	460 volts	230 volts	460 volts	without capacitor	with capacitor						
300 L	300	12	60%	100	50	108	54	65.4%	79%	80	60-430	363	28″	24″	30″
400 L	400	16	60%	124	62	140	70	65%	84.5%	80	75-550	400	28″	24″	30″
500 L	500	20	60%	158	79	174	87	66.7%	84.2%	80	90-670	415	28″	24″	30″

*Power factor is the average value which includes the benefits of the power factor capacitors when not welding (based on 60% duty cycle).

Because welding fabrication is our full-time business, A. O. Smith maintains the industry's most comprehensive research and development facilities. That's why we can offer you America's finest machines, accessories and electrodes. And when you call your man from A. O. Smith, you'll find that he's more than just a salesman. He's a welding specialist fully qualified to help with your welding problems.

Through research . . . a better way

A.O.Smith
CORPORATION
WELDING PRODUCTS DIVISION
Milwaukee 1, Wisconsin
A. O. Smith INTERNATIONAL S.A., Milwaukee 1, Wis., U.S.A.

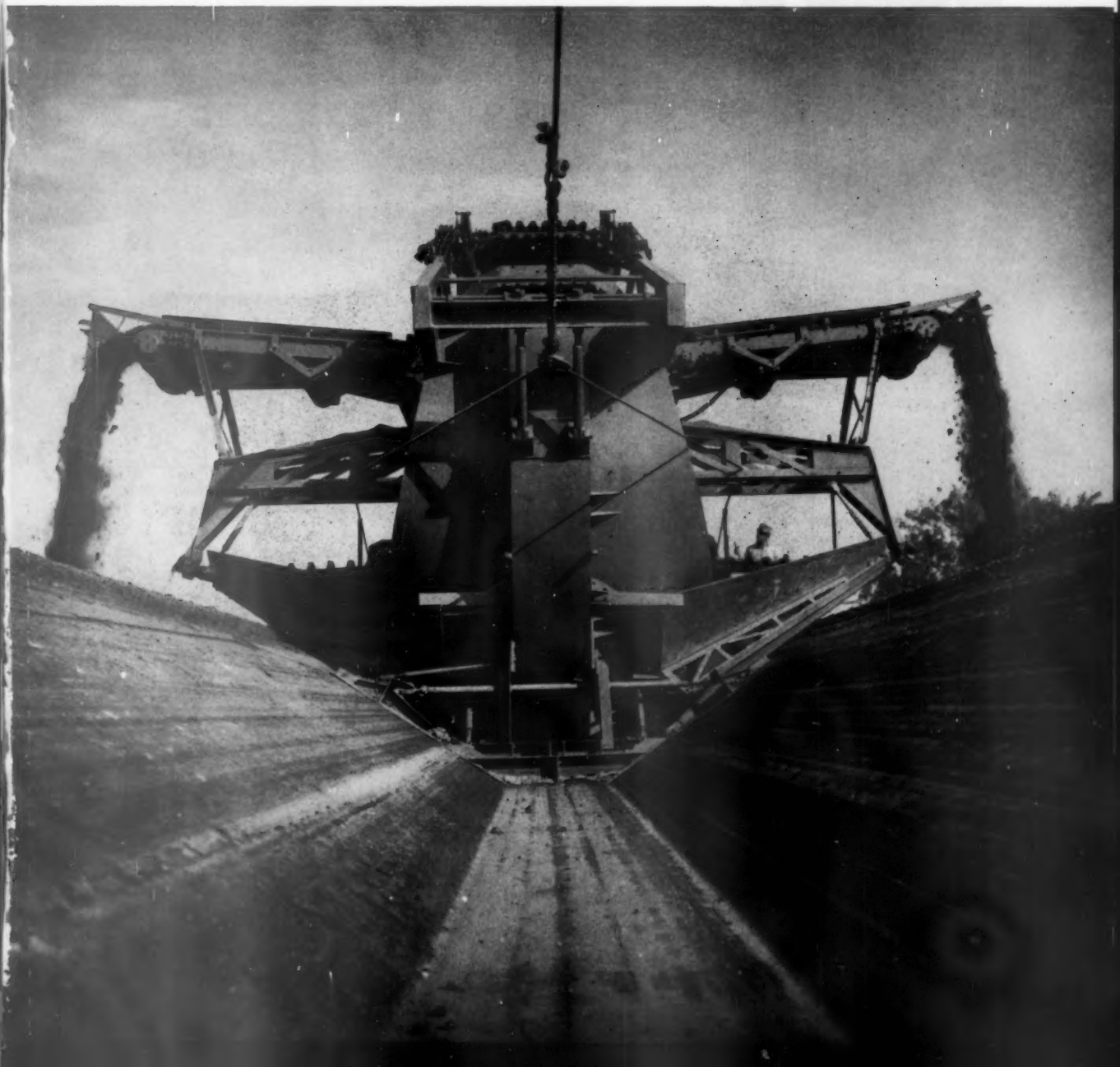
MW-263

LITHO IN U.S.A.

World's fastest ditching machine welded with M&T Murex electrodes

This monster machine carves out a continuous ditch 6′ deep, 4′ across at the bottom and 22′ across at the top, at the rate of 7′ a minute. Working at its top capacity of 800 cubic yards of earth an hour, the ditcher could keep a large fleet of dump trucks mighty busy. To give its all-welded frame superior rigidity for uniform digging, Gar Wood Industries used Murex electrodes – products of METAL & THERMIT CORPORATION, General Offices: Rahway, New Jersey.

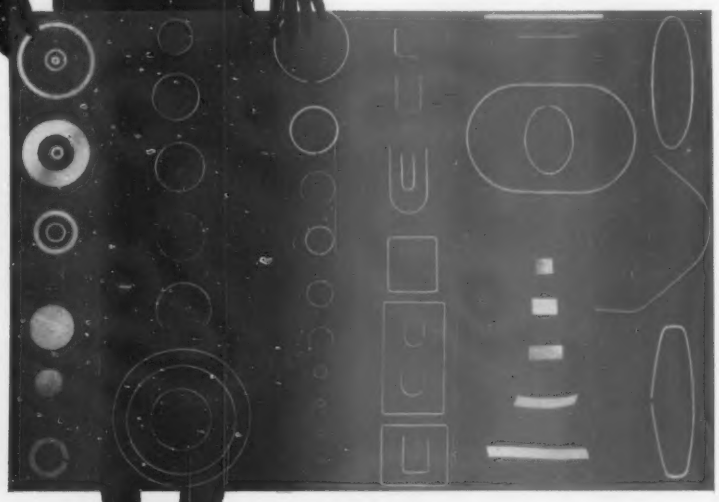
MUREX
PRODUCTS FOR BETTER WELDING



Preformed Alloys

Whatever your particular job calls for there is a dependable GB *Pre*-formed Silver Brazing Alloy available. Rings, squares, ovals, rectangles, disks, rods, strips. U-shapes, L-shapes—*any* shape at all, and *any* size you require.

These convenient, efficient, economical *pre*-forms assure strong, safe joinings. A measured amount of silver brazing alloy produces a better looking and more cost controlled joint. You SAVE time, you SAVE money.



Write to us for a quotation on any of your preform requirements. Full particulars on Silver Brazing alloys and GB #88 Flux contained in the GB Silver Brazing Data Book will be mailed on request.

Goldsmith Bros.
DIVISION OF NATIONAL LEAD CO.

900 WEST 18th STREET • CHICAGO 8, ILLINOIS

For More Information Circle No. 37 on Reader Service Card.

MEN ON THE MOVE

in the welding industry

PROMOTIONS:

CROCKETT

LEINENKUGEL

J. M. Crockett has been appointed vice-president-gases of Air Reduction Sales Company. A graduate of the South Dakota School of Mines, Mr. Crockett has been with Air Reduction since 1945 and, most recently, as manager of the company's office.

James M. Leinenkugel has been appointed product manager-distributive products for A. O. Smith International S.A. Mr. Leinenkugel, an engineering graduate of the University of Wisconsin, has served A. O. Smith in several capacities.

John T. Busby has been named field supervisor by Eutectic Welding Alloys Corp., Flushing, N. Y.

ELECTIONS:

J. P. Henry, Ampco Metal, Inc. vice president and general sales manager, has been elected a company director. At the same time, **Henry C. Fechtmeyer** was named a vice president of the Milwaukee firm.

John A. Bradner has been named vice president of the National Metal Trades Association, composed of more than 1,500 firms in the metal trades and other industries. Mr. Bradner is president of Lees-Bradner Company, Cleveland, Ohio, manufacturers of machine tools.

continued on page 22

Circle No. 61 on Reader Service Card.——→

World's most efficient power plant depends on M&T Murex electrodes

To get more electricity than ever from a ton of fuel, Philadelphia Electric's 325,000-kilowatt Eddystone No. 1 generating station superheats steam to 1200°F, 5000 psi pressure. No other power plant equipment handles steam at such high steam conditions. In welding most of the pipe for Eddystone, The M. W. Kellogg Company used Murex electrodes — products of METAL & THERMIT CORPORATION, General Offices: Rahway, New Jersey.

MUREX
PRODUCTS FOR BETTER WELDING

DO YOU BELIEVE IN MAKING A PROFIT?

PROFIT MEANS BETTER WELDING SERVICE AND BETTER WELDING SERVICE MEANS MORE PROFIT FOR YOU!

Your local welding supplier must make a profit on his sales to you, so that he can provide you with the "know how" to help you solve new and complex welding problems. Remember that when you ask for quotations...

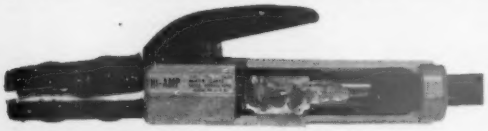
Call Your

Local Welding Distributor

- HE KNOWS THE BEST SOLUTION
- HE GIVES YOU QUICK SERVICE
- HE MAINTAINS A GOOD INVENTORY

he'll explain how

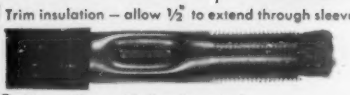
TPC* MAKES HI-AMP® ACCESSORIES COOLER



*THREADED POWER CONNECTION

2 Slip on threaded sleeve

1 Trim insulation — allow ½" to extend through sleeve



3 Crimp sleeve with Swedg-on tool

Screw sleeve into cable socket. (The ½" of cable strands will be forced against the holder tong member which gives another point of direct contact for good connection.)

Write for FREE booklet "Reducing Costs By Proper Care Of Arc-Welding Circuits"

LENCO, INC.

354 W. ADAMS ST. JACKSON, MO.

For More Information Circle No. 50 on Reader Service Card.

MEN ON THE MOVE

continued from page 20

APPOINTMENTS:

Robert T. Neilson has been appointed plant manager of National Welding Equipment Co., San Francisco. Mr. Neilson was formerly chief engineer of Prescolite Mfg. Corp.

Robert R. Leaming, Rahway, N. J., and **Henry C. Opie,** Elmhurst, Illinois, have been named Eastern and Midwestern managers respectively for Glenn Pacific Power Supply Corp.

Cecil Baltzegar has been named manager of the newly-created market research department of Omark Industries, Inc., Portland, Oregon. Mr. Baltzegar has been with Omark since 1953.

Robert Fowler has been appointed district representative for North Carolina, South Carolina, and Southern Virginia by the Milwaukee Electric Tool Corp.

Joseph T. Ryerson & Son, Inc. has appointed **William P. Loenrer** district sales manager and **Bruce D. Clausonthue,** manager of the general order division in Chicago.

Donald L. Hess of Bellefonte, Pa. has been transferred to the Southern California sales staff of Titan Metal Manufacturing Co., division of Cerro de Pasco Corp. Hess will headquarter in Los Angeles.

The Lincoln Electric Company has expanded its sales force with the addition of two field welding engineers. **Charles A. Stratton** is in the Kansas City office; **Robert E. Haas, Jr.,** in Chicago.

George P. Higgins has been appointed field engineer for Norton Company of Worcester, Mass., in the company's Teterboro, New Jersey district.

continued on page 25

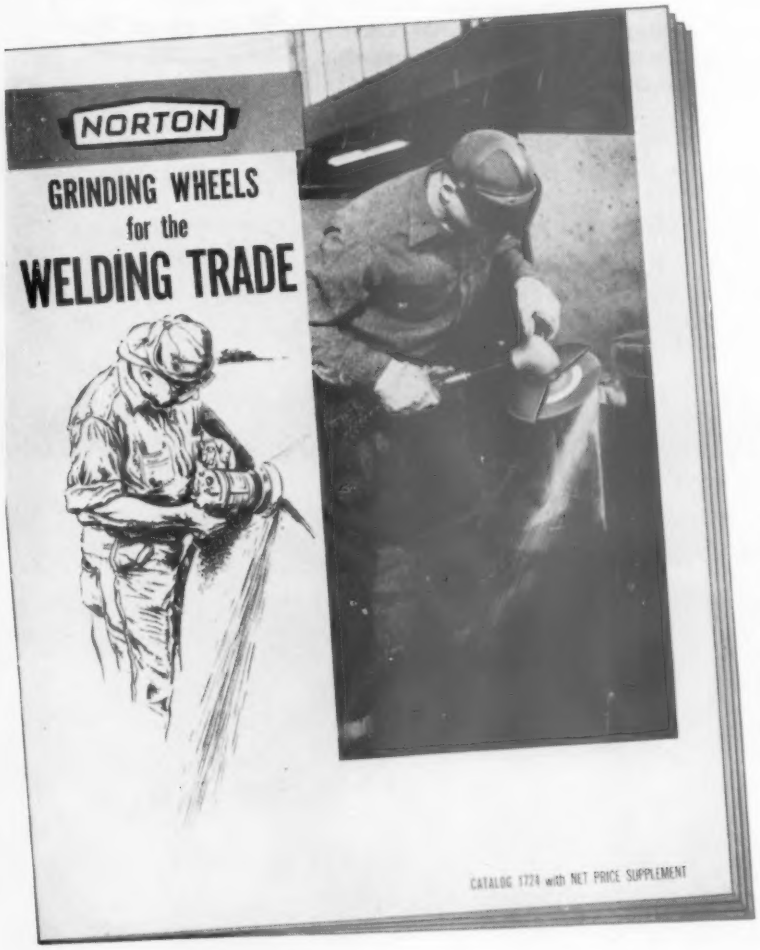
Circle No. 61 on Reader Service Card.→

World's thirstiest flood pumps welded with M&T Murex electrodes

Some of the biggest pumps in the world are controlling flood damage in Florida's Lake Okeechobee area. With intake pipes 12 feet in diameter, they suck up swimming pool sized gulps of flood waters every second, spew it out into a series of reservoirs. Though not yet complete, the system has already prevented an estimated $44-million damage. The thirteen Fairbanks-Morse pumps in use were welded with M&T Murex electrodes—products of METAL & THERMIT CORPORATION, General Offices: Rahway, New Jersey.

MUREX
PRODUCTS FOR BETTER WELDING

For best results on all your grinding jobs...



get this complete guidebook

In this new catalog you get a lot more than just a listing of Norton weld grinding wheel types and sizes.

It brings you detailed information on the complete line of Norton wheels to do every grinding job better . . . describes the many different types of wheel construction . . . gives you facts about their performance, with on-the-job photos . . . lists applications for each different wheel . . . includes an up-to-the-minute net price supplement, covering all wheels.

All Norton resinoid wheels, incidentally, are now produced in the new 5-acre Norton Worcester Plant No. 8, on the most modern equipment ever developed. The Norton weld grinding favorites made here include the reinforced types — BD and BDA rigid and BFR semi-flexible — plus straight wheels, cut-off wheels, cups, cones and mounted wheels.

Find out which of these fast, tough wheels can benefit you most. Get your free copy of the new catalog from your Norton Distributor, or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

NORTON
ABRASIVES

W-1983

75 years of... Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Electro-Chemicals — **BEHR-MANNING DIVISION:** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

For More Information Circle No. 69 on Reader Service Card.

MEN ON THE MOVE

continued from page 22

APPOINTMENTS

Frank A. Schumacher has been named sales and dealer representative for the Beaver Welding Supply Co., Memphis. Mr. Schumacher has been in the welding supply business for 12 years.

William J. Bennett is the new national field sales manager of the Coated Abrasives Division of the Behr-Manning Co., Troy, N. Y.

William Bajari is a new field representative for Arcair Company, Bremerton, Wash. He will cover the 13 western states.

William Brunson of Nashville, Tenn., is new district representative for Milwaukee Electric Tool Corp., Milwaukee.

John P. Coltman is Eastern sales representative for Norris-Thermador Corp., Los Angeles, Calif. He will work out of Middletown, N. J.

Earl Roper has been appointed Southern factory sales representative for Sellstrom Mfg. Co., Palatine, Ill.

Malcolm M. Maynes is new chief sales engineer of abrasives for Norton Company, Worcester, Mass.

J. S. Stevens is district manager of Air Reduction Sales Company's Birmingham office.

Allan S. White is a field engineer for Norton Company, Worcester, Mass., in Celevland, Ohio.

Matt P. Hirt has been named factory representative by the Alva Allen Industries, Clinton, Mo. Mr. Hirt will cover Missouri, Oklahoma, Nebraska, Iowa, Kansas, Minnesota, and parts of the Dakotas.

Ransome Company, Scotch Plains, N. J., has opened an office in Pittsburgh to serve its central sales region. **P. J. Patton** has been named regional manager of the new office at 345 Mount Lebanon Blvd. and will supervise sales in six surrounding states.

AWARDS:

Charles J. Haines, (left) president of Chemetron Corp., Chicago, was awarded a distinguished service medal in engineering at the University of Missouri in Columbia. Making the presentation was Dean Huber O. Croft of U of M, College of Engineering.

RETIREMENTS:

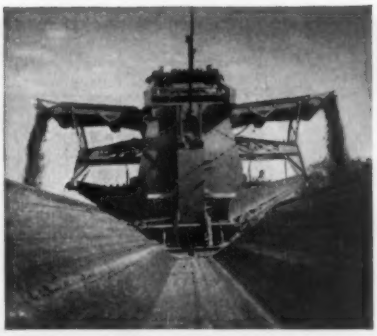
The retirement of **Charles D. Cooper,** a pioneer in welding and a charter member of the American Welding Society, has been announced by the Metal & Thermit Corp. Mr. Cooper is a 30-year veteran with the company.

WANTED:

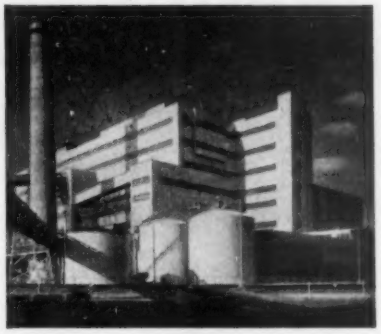
Carl Herman Mathews is being sought by the FBI for unlawful flight to avoid confinement for robbery. He has been known to carry firearms and is considered dangerous.

Mathews is an excellent welding operator, engraver, and machinist.

If you know his whereabouts, contact your nearest FBI Division Office.



World's Fastest



Most Efficient

Most Thirsty

The fastest ditcher in the world ... the most efficient power plant in the world ... some of the biggest pumps in the world ... all were joined with M&T Murex electrodes. These electrodes always seem to turn up on the important jobs ... the ones that win engineers' admiration.

There are over 1000 types and sizes of Murex electrodes ... one of the broadest lines of electrodes and wires for arc welding ... with stocks and service offices in every major manufacturing area. Send for free Electrode selector.

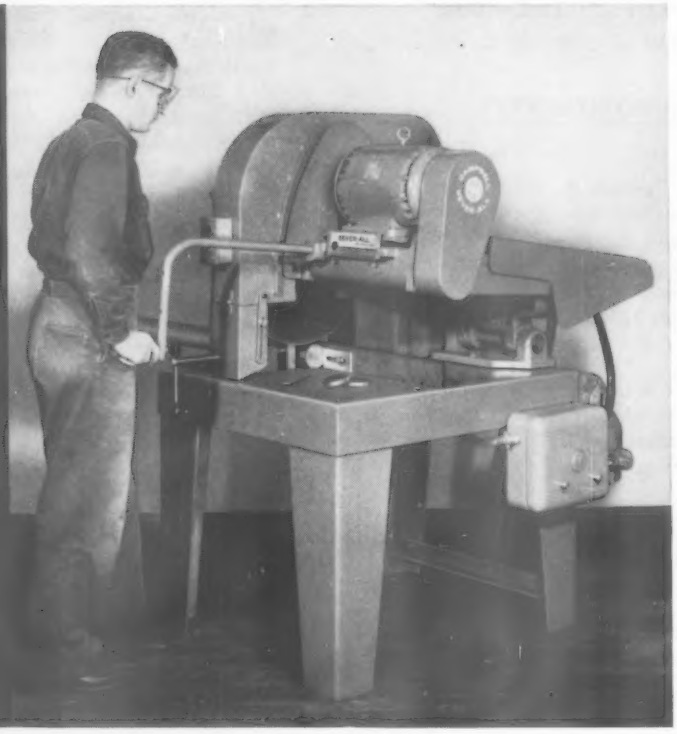
M&T welding products

METAL & THERMIT CORPORATION
General Offices: Rahway, New Jersey

Circle No. 63 on Reader Service Card.

NEW!

GREATEST CUT-OFF CAPACITY IN ITS CLASS!



• This newest addition to the Sever-All line of abrasive cutting machines—the Model 2-A—provides greater cutting capacity and more flexibility than any other machine in its class. Check these important advantages:

Big capacity • cuts 4″ round or square solids, 6″ diameter tubing or standard pipe, 6″ x 1″ flat stock, 6″ angle iron and 8″ channels. Cuts practically all metals.

Fast operation • accurate cuts at the rate of 2 to 3 seconds per square inch. For instance, you can cut a 4″ bar of hardened steel in 45 seconds, or a 2″ pipe in 3 seconds.

Power oscillation • oscillation—the forward and backward motion of the cutting wheel as it is fed down into the cut—gives you extra cutting capacity without excessive horsepower load on your power lines. It also contributes to longer wheel life and reduced operator fatigue.

Quality cuts • clean, smooth cuts, even on large sections, because wheel oscillation provides cooler cutting action.

Economy • Sever-All abrasive cutting wheels, developed specially for the Model 2-A, assure you of lowest cost per cut.

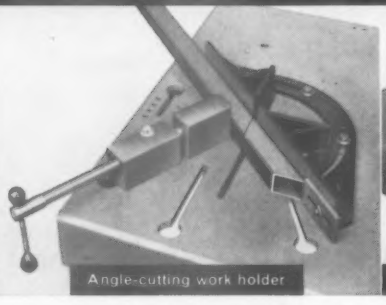
Safe • wheel guard provides complete operator protection.

Minimum maintenance • all bearings are the pre-lubricated and sealed type. Clean, simple machine design permits easy housekeeping.

Built to last • rugged machine bed and rigid castings make the Model 2-A first choice for heavy-duty jobs.

VARIETY OF WORK HOLDERS GIVES UNUSUAL VERSATILITY

V-block with quick-action clamp



Angle-cutting work holder

2-way clamp for irregular shapes

Choose the work holders you need from several optional arrangements. These include the vise-type holder shown on the machine at top, plus the V-block, angle-cutting and 2-way clamp fixtures above. All fit interchangeably on the Model 2-A Sever-All. Screw-type and quick-action clamping also may be used interchangeably.

***Write for details** on the new Model 2-A Sever-All abrasive cutting machine. Ask for Bulletin DH-299*

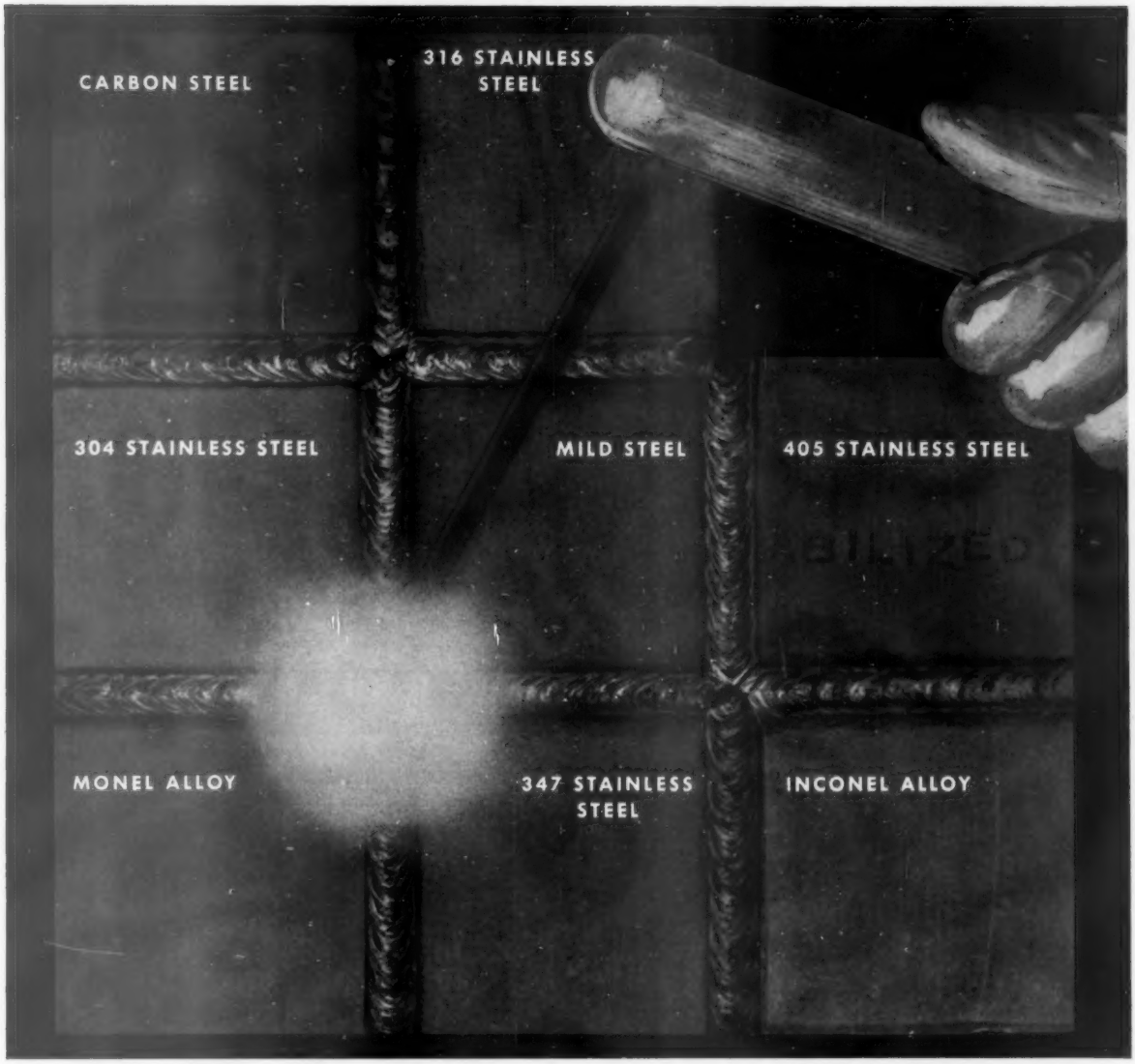
ACCO

SEVER-ALL ABRASIVE CUTTING MACHINES

Allison-Campbell Division, American Chain & Cable Company, Inc.

925 Connecticut Avenue, Bridgeport 2, Conn.

For More Information Circle No. 4 on Reader Service Card.



Now <u>one</u> electrode, Inco-Weld "A", welds most dissimilar alloy joints...

many other problem joints as well

Now . . . with just one type of electrode . . . you can do 90% of your tough welding jobs.

This versatile electrode is Inco-Weld "A"* – with the distinctive green flux coating.

Inco-Weld "A" electrode produces X-ray quality welds between most dissimilar alloys . . . 30 known combinations to date. It also produces satisfactory "impossible" joints . . . welds, for example, in equipment too big for preheat.

These welds are strong, sound and corrosion-resistant, suitable for severe service and pressure conditions.

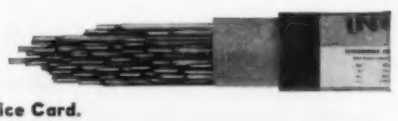
Read where and how Inco-Weld "A" electrode is being successfully used. See examples of the work in the new Inco-Weld "A" folder. They will open your eyes to important savings. For your copy, just write Inco.

*Registered trademark

HUNTINGTON ALLOY PRODUCTS DIVISION
The International Nickel Company, Inc.
Huntington 17, West Virginia

INCO-WELD "A" electrode is supplied in 14-inch lengths in four diameters, 3/32-, 1/8-, 5/32-, and 3/16-inch...packed in 5-lb containers.

INCO WELDING PRODUCTS



electrodes • wires • fluxes

For More Information Circle No. 47 on Reader Service Card.

"Yes, the De Witt System of Joint Preparation is Worth Investigating"

said **13** prominent pipe manufacturers and welding experts who saw it demonstrated

More than 20 years of preparation were required to develop the De Witt System of Joint Preparation. Revolutionary in concept and application, it prepares joints in ANY metal with a minimum of work and expense.

Those who have seen the system in operation are amazed at the ease and speed with which you can switch pipes, thickness of walls or angle of intersection without the use of dies or expensive milling equipment.

The De Witt System uses carbide tooth saws or Wallace safety type abrasive wheels and is the outgrowth of Wallace "Cut-Machining", the low cost process used throughout the metal working industry.

LET'S TALK IT OVER

Phone Now...Collect

BUckingham 1-7000

and ask for Ed De Witt

If You Prefer, Send for Free Booklet

WALLACE SUPPLIES MFG. CO.

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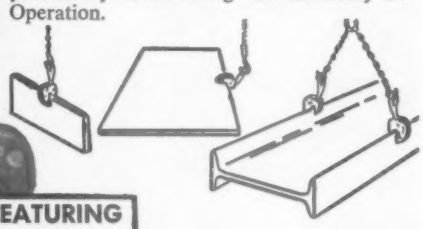
YOUR BEST MOVE IS TO MOVE WITH

MERRILL

MATERIAL HANDLING DEVICES FOR THE MOST IN *Safety and Economy*

Imitated, but never duplicated, Merrill Lifting Clamps are Drop Forged to give you Safety in Handling and Economy in Operation.

6 SIZES



FEATURING THIS MONTH . . .

Over 25 Material Handling Devices described in our catalog C-2.

Ask for a copy.

LARGE OPENING "G" CLAMP

MERRILL BROTHERS

Producers of Drop and Press Forgings

56-55 Arnold Ave., Maspeth, N. Y.

1-60A

MURCO POWER DRIVEN *forge hammers*

MOTOR DRIVEN

Extremely powerful yet comparatively simple in design, MURCO Power Driven Forge Hammers can be operated under perfect control and with very little effort. Illustrated are the five sizes of motor driven models made in 25; 50; 100; 250; and 500 pounds RAM. The RAM design is a special feature . . . a steel casting, balanced and carefully machined, operates in V guides . . . large bearings for toe and toggle bolts . . . guide bearings extra long and wide. Perfect alignment of Ram Travel prevents twisting because the Ram is parallel with travel—a very important feature. Write today for complete specifications and price on the model to meet your requirements.

BELT DRIVEN 5 SIZES

MURCO Power Driven Forge Hammers are also made in five models belt driven in 25; 50; 100; 250; and 500 pound ram sizes.

MURCO

D. J. MURRAY MANUFACTURING CO.

Manufacturers Since 1883 WAUSAU, WISCONSIN

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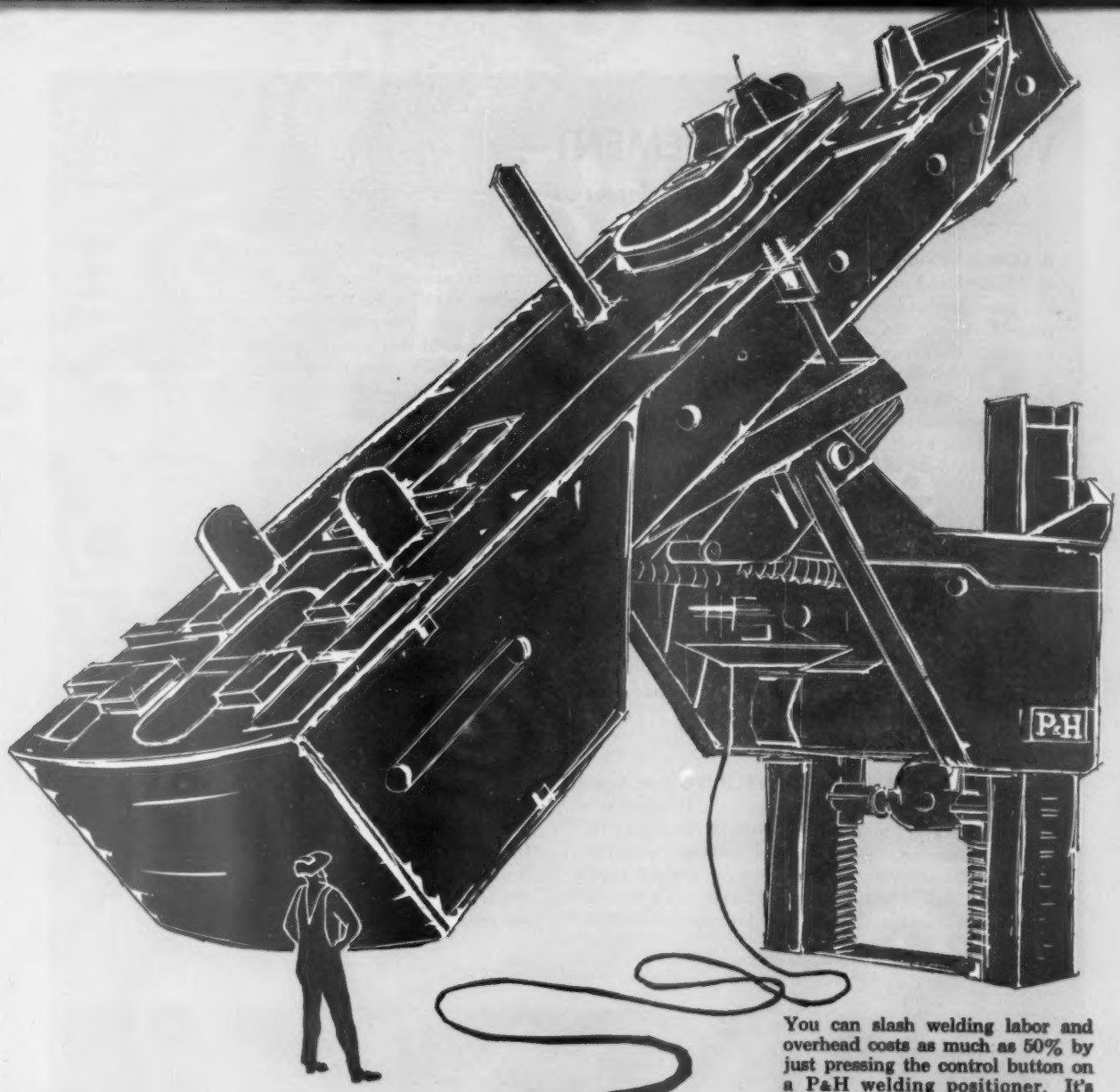
Circle No. 42 on Reader Service Card. ⟶



this is all it takes to cut welding costs in half!

You can slash welding labor and overhead costs as much as 50% by just pressing the control button on a P&H welding positioner. It's being done every day.

P&H weldment-positioning is a one-man, fingertip-controlled operation. Once the piece is secured, the operator can raise and tilt it at the most convenient angle through 135° — without extra help or equipment.

Weldors can work in the less tiring and much more efficient *downhand* position. They can use "hotter" rods for heavier, smoother first-run beads. In most cases, *the number of passes drops from three to one.*

There are 14 P&H positioner models. Capacities from 100 lbs. to 100,000 lbs. — with variable speed, if desired. Write for information on the capacity you need.

314

P&H

HARNISCHFEGER

Milwaukee 46, Wisconsin

Export Division:
4329 W. National Ave., Milwaukee, Wis.

P&H welding equipment is manufactured and sold in Canada by REGENT EQUIPMENT MANUFACTURING COMPANY, Ltd. 455 King St. West • Toronto, Ontario, Canada

WELDING MANAGEMENT

watches these developments

A LONG-TERM LEASE PLAN for its complete line of standard and custom steel presses and press brakes has been announced by Verson Allsteel Press Company, Chicago. The announcement was made jointly by Melvin D. Verson, vice president-administration, of Verson, and Robert Sheridan, president of Nationwide Leasing Company, Chicago, which will underwrite the lease program. (A discussion of the leasing of high price capital equipment appeared on page 38 of the June, 1959, issue of INDUSTRY & WELDING.)

OXYGEN-PRODUCING CAPACITY of Linde Company, Division of Union Carbide Corp., will increase 4,000 tons per day as a result of scheduled expansion of facilities at 16 locations throughout the country. In announcing the program, William B. Nicholson, Linde president, pointed out that this is the continuation of the accelerated expansion of recent years in which Linde has placed new oxygen plants on-stream at the rate of one a month since 1955.

ADVANCES IN DIFFUSION WELDING now make it possible to obtain excellent bonds at temperatures as low as 650°F, according to Battelle Memorial Institute, Columbus, Ohio. The new method, related to forge welding, involves the use of one or more intermediate metals to join the base material. D. C. Martin, welding technologist, says that intermediate metals used in studies at Battelle have usually been ones which could be applied by plating. He explains that intermediate metals make it possible to make joints at temperatures far below those which would be required if two pieces of metal were pressure bonded directly to each other. In some cases, these intermediate metals also drastically reduce or eliminate the need for deformation during bonding.

GOOD BUSINESS IN 1959 and a promising outlook for 1960 are reports from two welding industry leaders.

The first, Harris Calorific Co., Cleveland, reports that 1959 was the best year in its 55-year history. C. M. Taylor, president, reports that domestic sales increased 52 percent over 1958. Mr. Taylor stated: "With our increased production facilities and new gas welding and cutting apparatus being released for manufacture, we expect to increase our penetration of the market even more in 1960." In keeping with this program in the domestic markets, Harris has also instigated an aggressive foreign expansion in Australia and Mexico.

The second, Metal & Thermit Corp., Rahway, New Jersey, reports the overall sales outlook for the welding industry during the rest of 1960 is promising. R. T. Brown, manager of Metal & Thermit's Welding Division, says his first quarter sales are running slightly ahead of the 1959 pace. Mr. Brown looks for this trend to continue, and perhaps even improve, during the rest of the year.

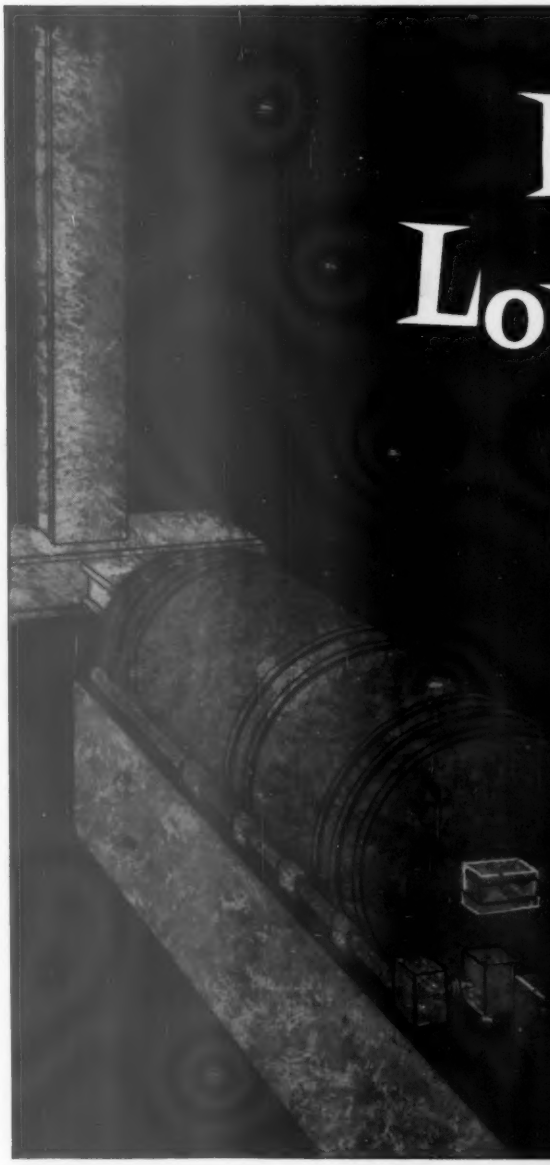
"CHARLIE THE CRANE" gives a warm glow of pride to 75 employees at Airline Welding and Engineering's new Gardena, California, plant. Charlie, who cost $21,000, a $16,000 mill, and a $26,000 20-inch swing lathe is their contribution to new tooling in Airline's 200-foot deep shop.

Where did the 75 workers get $63,000 for this new shop equipment?

Byron R. Russell, Airline's president, explains it: Airline had put over $100,000 into an employee profit-sharing trust fund. When the move to the new plant was planned, Russell asked his employees if he could borrow from the fund to buy the new equipment.

They agreed.

The loan was made under rigid bank control with the equipment as security. Airline employees get six percent interest on their money.



Ransome Loves Those Specials

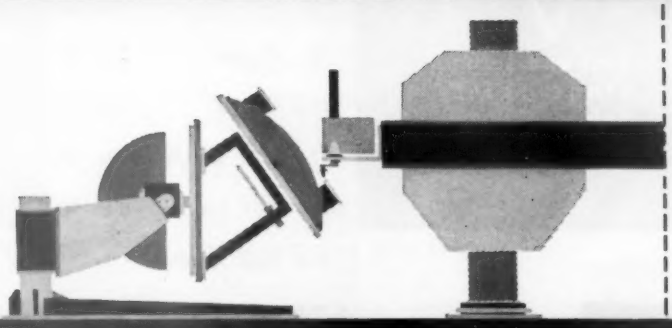
ANOTHER EXPANDED RANSOME SERVICE...

"JOB-FITTED" AUTOMATION WELDING EQUIPMENT

Whatever your custom tooling requirements . . . whatever your automation welding requirements — where Ransome standard equipment does not fit the job, **we tool to fit.**

Whether you build an atomic sub or an underground fuel tank, we'd be pleased to show you how Ransome-imagin-eering can help you do the job more efficiently at less cost. Whatever your welding positioning need, you can expect the new, the different, the better from Ransome! Ransome designers and engineers will job-fit to do the job you want done!

Give Ransome your toughest job . . . let us prove our experience will pay off in profits for you. Please call or write today.



Ransome Company, Scotch Plains, N. J.

- ☐ Send your catalog and more data on Ransome "Job-Fitted" positioning equipment.
- ☐ Have your sales engineer contact me.
- ☐ My positioning problem is:.....

.....

.....

Name.....

Company.....

Address.....

City, Zone, State.....

Ransome Company

MACHINE TOOLS FOR WELDING

Division of Big Three Welding Equipment Co.

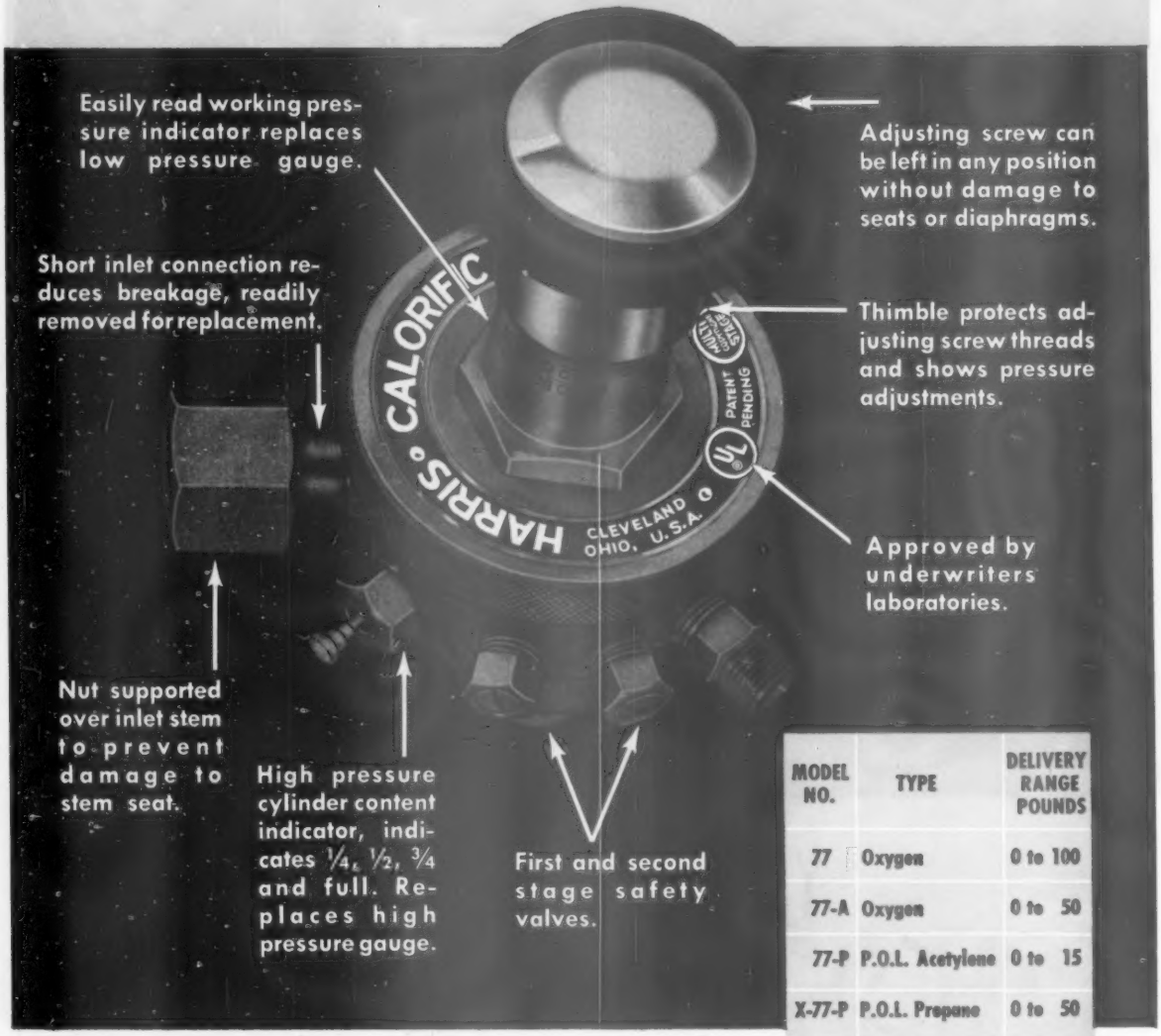
Scotch Plains, New Jersey

RANSOME . . . THE PIONEER IN POSITIONING FOR WELDING

For More Information Circle No. 73 on Reader Service Card.

RUGGED..DAMAGE PROOF!

HARRIS IMPROVED MULTI-STAGE 77 GAUGELESS REGULATOR


Easily read working pressure indicator replaces low pressure gauge.
Short inlet connection reduces breakage, readily removed for replacement.
Nut supported over inlet stem to prevent damage to stem seat.
High pressure cylinder content indicator, indicates 1/4, 1/2, 3/4 and full. Replaces high pressure gauge.
First and second stage safety valves.
Adjusting screw can be left in any position without damage to seats or diaphragms.
Thimble protects adjusting screw threads and shows pressure adjustments.
Approved by underwriters laboratories.
HARRIS • CALORIFIC
CLEVELAND OHIO, U.S.A.
PATENT PENDING

MODEL NO.	TYPE	DELIVERY RANGE POUNDS
77	Oxygen	0 to 100
77-A	Oxygen	0 to 50
77-P	P.O.L. Acetylene	0 to 15
X-77-P	P.O.L. Propane	0 to 50
77-D	Coml. Acetylene	0 to 15
X-77-D	Coml. Propane	0 to 50

For more details, see your nearest Harris distributor or write to us.

HARRIS

HARRIS CALORIFIC CO.

8501 CASS AVE. • CLEVELAND 2, OHIO

For More Information Circle No. 43 on Reader Service Card.

R. D. THOMAS New A.W.S. President

1960 ADAMS LECTURE was presented by Dr. Robert D. Stout, head of the Department of Metallurgy at Lehigh University. AWS President Charles I. MacGuffie (left) makes award.

SYMBOLIC CHAIN is flame cut by President-Elect R. D. Thomas to open AWS Welding Show. Assisting are Glenn M. Anderson, lieutenant-governor of California (left), and Harry Huff, Air Reduction Sales Co. (right).

J. F. LINCOLN GOLD MEDAL is presented to K. R. Notvest (right) by AWS President Charles I. MacGuffie.

Highlights of A.W.S. Convention and Show

LOS ANGELES: The 41st annual meeting of the American Welding Society held here in April was highlighted by the honoring of 31 individuals with 19 national and 12 regional awards. These included:

Dr. Robert D. Stout, head of Lehigh University's Department of Metallurgy; was the Adams Lecturer. He received a certificate and an honorarium for his paper on "Higher Strength Steels in Welded Structures."

PAUL LEONARD

UNLUCKIEST MAN at the AWS Welding Show was probably Paul Leonard, president of Lenco, Inc. He came so close to winning a new automobile that it wasn't funny.

In a guessing contest sponsored by Metal & Thermit Corp., Mr. Leonard tied a Show visitor in guessing the number of electrodes in a container.

To settle the tie, each contestant was told he was within 10 of the correct answer and was asked to guess again.

Leonard guessed 5972; the visitor picked 5970. The correct and car-winning total was 5969.

K. R. Notvest is the 1959 Lincoln Gold Medalist. His paper on "Welding of Medium-Alloy Chrome-Moly Steels" was the best published in the WELDING JOURNAL in 1959.

B. E. Rossi, editor of the WELDING JOURNAL, received the Samuel Wylie Miller National Award for contributing to the advancement of welding and cutting.

Harry Schwartzbart of Armour Research Foundation received the Educational Lecturer Certificate Award for contributing to the Society's Educational Program.

ELECTION OF OFFICERS

R. D. Thomas, Jr., president of Arcos Corporation, was elected president of the AWS and was presented to members at opening ceremonies. Mr. Thomas has been active in the American Welding Society for years. His devotion to the Society is indicated by the fact that he attended the Convention against his doctor's wishes and participated in Convention activities while running a fever of 104.

A. F. Chouinard of National Cylinder Gas Co. was

BYRON HELMS, Victor Equipment advertising manager (second from left), helped sales force answer questions.

GEORGE F. LEHR, Pacific Coast division manager for Page Steel & Wire Division, American Chain & Cable Co., shows spool of welding wire.

PHILIP DEUCHLER, district sales manager for Handy & Harman (right), talks with George Cremer, senior staff engineer for Solar Aircraft Co., San Diego.

LEONARD BILLINGS (left) lights up welding torch for prospect at Prest-O-Matic booth.

A. C. GILBERT (right) and busy staff at booth of Jackson Products Division of Air Reduction Sales Co.

JOHN COYNE (center) was caught impromptu and busy at Coyne Cylinder Company booth.

TED T. ROWLANDS, assistant sales manager, displays grinding wheels at Simonds booth.

re-elected vice president. Also elected vice presidents were *J. H. Blankenbuehler,* Hobart Brothers Co., and *Clarence E. Jackson,* Linde Company.

Eight district directors were named: *James M. Shilstone, David P. O'Connor, George W. Kirkley, Lester L. Baugh, Dr. Robert D. Stout, John Mikulak, R. B. McCauley, and Dr. Ernest F. Nippes.*

WELDING SHOW HIGHLIGHTS

Over $3-million worth of welding equipment, products, and accessories were displayed during the Society Welding Show held concurrently with the Convention. The display is claimed to be the largest assembly of welding equipment and materials ever gathered under one roof.

ELLDE I. WAGNER, technical representative (right), gives data to South American visitor, Mario Vignola, manager of Vignola & Co., Valparaiso, Chile (second from right).

AT MCKAY BOOTH were L. J. Van Nunwegen, Air Force (back to camera); Lyle Mitchell, Weldfab, Inc.; Albert Smith, McKay sales manager; W. I. Lutes, manager of McKay's hard surfacing division; and Lawrence McKay.

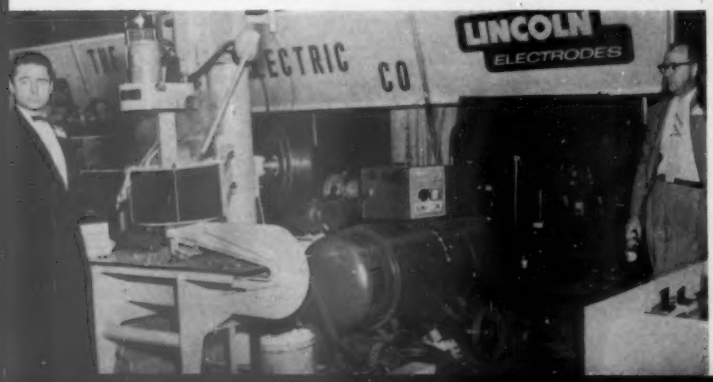
RAY TOWNSEND (left) and a visitor are surrounded by the Tweco Products booth.

BERNIE ROBERTSON (second from left) is busy at Blackhawk Industrial Division's booth.

W. H. HOBART, JR. (left) answers a visitor's question at Hobart Brothers Company booth.

AT LENCO BOOTH is Paul Leonard, president (third from left); Ken Hagerty, Hagerty Mfg. Co. (extreme left); and August F. X. Michelini (center) Tec Torch vice president.

PETE SAWYER, Lincoln Electric's director of advertising and sales promotion, was kept busy demonstrating new products.



ROY L. RASMUSSEN (extreme right) of Harris Calorific Co. shows torch kit to show visitor.

Al Earlbeck found a safe, fast

The sheet steel bodies of truck trailers can be murderous when you have to cut through them to do repair or special installation work. Cutting with metal saws produces edges as jagged and mean as shark teeth.

At Baltimore's Warner Fruehauf Trailer Company, distributor of Fruehauf Trailers, they tried using abrasive wheels to remove the jags but the job tore ordinary wheels to pieces so it had to be done by hand with files. And that was both slow and dangerous work for the man behind the file.

Then came Bay State distributor Al Earlbeck of Earlbeck Welding Supplies, Inc. He introduced Bay State's reinforced raised hub disc wheels and the results were astonishing. Not only did the Bay State wheels stand up to the work of grinding down jagged sheet metal edges, they even outperformed saws when it came to cutting the tough, thin, corrugated, stainless steel panels. Furthermore, they did an outstanding job of grinding down spot welds on chassis assemblies and other trailer components. Wheel-loading became a thing of the past and the Bay State wheels wore down so evenly they could be used almost down to the center hub.

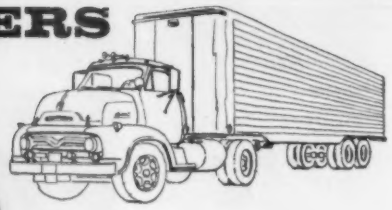
As Warner Fruehauf Shop Foreman Melvin Wengert says, now that he's been using the Bay State wheels for some time . . . "you can't beat 'em for safety and versatility. They do the job better than any other method and any other wheel . . . and that's that." Wengert, incidentally, is a man with some 20 years experience in welding and general metal-working problems.

Like Al Earlbeck, your own Bay State distributor or direct representative has both the products and the specialized knowledge that enable him to improve any grinding operation that *can* be improved. Why not turn him loose on yours and see what he comes up with? *Better grinding at lower cost . . . that is his business.*

(Left) Warner Fruehauf Shop Foreman Mel Wengert checks weld bead with Al and Tom Earlbeck after weld had been ground with the same wheel that was used to smooth sheet metal edges of aperture cut in trailer body.

(Below) Operator Jerry Clark trims stainless steel burrs from opening made for installation of refrigeration unit.

answer to grinding the "shark's teeth" on TRUCK-TRAILERS



Al Earlbeck has 25 years of practical experience in grinding problems and has also taken just about every course there is in welding technology . . . starting at Baltimore Polytechnic Institute and winding up with advanced courses at Johns Hopkins. His son, Tom, is currently going through the same tough schedule of technological training. Meanwhile, Al himself sponsors courses and serves as executive of many technical associations as well as running Earlbeck Welding Supplies, Inc. He has tried other competitive grinding wheel lines but dropped them because he always found Bay State superior in both quality and service.

BAY STATE ABRASIVES

BAY STATE WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Chicago, Cleveland, Detroit, Los Angeles, Pittsburgh. *Distributors:* All principal cities.

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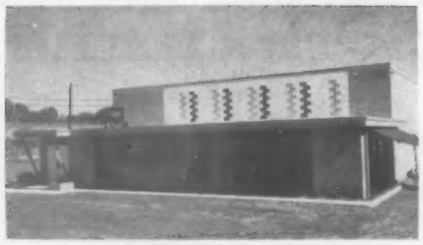
the place . . .



MODERN, NEW BUILDING of Earlbeck Welding Supplies, Baltimore, is scene of six-session welding course.

the people . . .

NINETY WELDING engineers, plant superintendents and company executives attended the course. In the front row are Al Earlbeck, Fred Plummer, George E. Linnert, Tom Earlbeck, and Peg Arnew.

the pause . . .

TYPICAL STUDENTS take a break. They are: Don Wernz, supervising welding engineer, Martin Company; Frank Horlebein, superintendent, Koppers Company; Hugh Justis, chief welding engineer, Martin Company; Al Earlbeck, and Charles Haegerich, general foreman, Koppers Company.

Distributor's educational course is added service

BALTIMORE: Helping their customers solve welding problems is one job that faces all welding supply distributors. However, most distributors wait until a problem comes up. Then they help solve it.

One distributor who has taken a different approach is A. C. Earlbeck of Earlbeck Welding Supplies, Inc. This progressive distributor gives his customer in advance the knowledge they need to solve their own problems—without distributor assistance. He does it through a non-profit educational course on the metallurgical problems of welding. This year, for the third time since 1954, Earlbeck sponsored this course believed unique among this country's distributors.

"Solving Welding Problems: The Easy Way" is the title of the course held on six consecutive Tuesday nights in February and March at Earlbeck's modern, new plant at 8401 Pulaski Highway, Baltimore. The teacher was George E. Linnert, supervising research welding metallurgist of Armco Steel Corp. He gave an introduction to metals and then covered plain steel; alloy steels; stainless steels; special steels; and aluminum, nickel, and other metals.

Mr. Linnert's class included 90 of Baltimore's leading welding engineers, plant superintendents, and company executives. They came from nationally-known, Baltimore-based companies like Bendix Radio, Bethlehem Steel, Edgewood Arsenal, Koppers Company, Martin Company, and Western Electric Co.

Also featured during the sessions were displays of the latest equipment and accessories for welding, brazing and cutting. Manufacturers whose products were displayed included Linde Company, Division of Union Carbide Corp., and Bay State Abrasive Products Co.

NEW MILLER CONSTANT POTENTIAL D-C WELDER CP-3-VS

X-ray perfect MIG welds on aluminum, magnesium, stainless and carbon steel sheets down to .030" are the routine result with the New Miller Constant Potential, CP-3-VS. Continuous slope and voltage adjustment even during the course of the weld means that the operator is able to "tune in" the desired settings. There's no burn-through; there's no spatter. Actually, a new performance high in low voltage welding is established with the introduction of this welder with its broad range of from 300 amps at 30v to 25 amps at 10v.

Complete specifications, as well as recommendations for your particular application problems, will be sent promptly upon request.

miller ELECTRIC MANUFACTURING CO., INC., APPLETON, WISCONSIN

EXPORT OFFICE: 250 West 57th St., New York 19, N.Y. • Distributed in Canada by Canadian Liquid Air Co., Ltd., Montreal

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IAA Honors Keel At 62nd Anniversary Convention

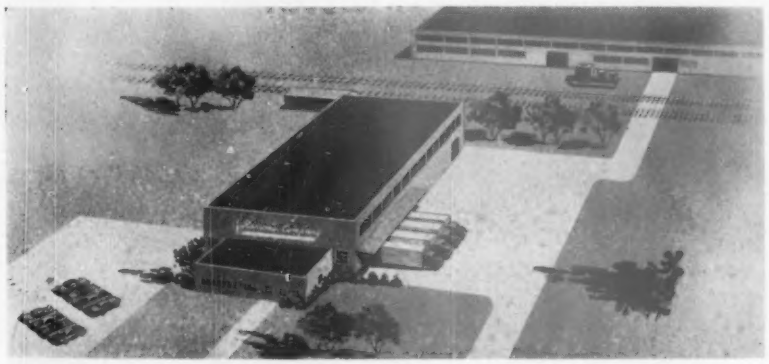
SAN FRANCISCO: Dr. Charles G. Keel, managing director of the Swiss Welding Association and "father" of the progressive Swiss regulations on carbide, acetylene, and oxygen, was awarded 1960 Morehead Medal of the International Acetylene Association. The award, which was presented at the IAA's 62nd Anniversary Convention in San Francisco on May 9th and 10th, is presented annually to the individual who has contributed most towards advancement of the art of producing or utilizing calcium carbide or acetylene.

KEEL

A graduate of the Swiss Federal Institute of Technology in Zurich, Dr. Keel is currently Managing Director of the Swiss Welding Association, formerly the Swiss Acetylene Association. Son of the late Professor C. F. Keel, an internationally-known pioneer in the oxy-acetylene welding field, Dr. Keel is also President of the Swiss Federation of the Technical and Periodical Press and Editor of the Swiss Welding Journal.

In addition to writing numerous articles on welding problems, Dr. Keel is the author of "Welding Techniques," published in 1957, and "Inert Gas Welding," released this year. A Colonel (Signals) in the Swiss Army, Dr. Keel has twice visited the United States to attend meetings of the World Metallurgical Congress. In addition to his many other affiliations, he is a member of the American Welding Society.

Presentation of the Morehead Medal to Dr. Keel took place on May 10th in the Colonial Ballroom of the St. Francis Hotel in San Francisco, and was the culmination of the 1960 meeting of the International Acetylene Association, one of the country's oldest technical organizations.



Ransome Manufacturing Plant Nears Completion

HOUSTON: Although taller than the average 4-story building, the Ransome Company's new manufacturing plant nearing completion here is actually only one story high. It has been built this way so that even the the tallest Ransome manipulators and positioners can be handled easily. There is 32 feet of free space under the crane hooks.

The new building gives the company about 25,000 square feet of manufacturing floor space. It adjoins facilities of the Big Three Welding Equipment Co., the parent company and Texas distributor of Ransome.

more about RWMA

by **W. H. CARRIGAN**
president
Resistance Welder Manufacturers Association

THE FIFTEEN MEMBERS of the Resistance Welder Manufacturers' Association are designers and builders of quality lines of standard and special machinery: spot, butt, flash-butt and projection welders; welding guns, transformers, presses; arc welding machines; metal-forming equipment; complete lines of special and multi-purpose high production machines; completely automated production lines; and special automatic production equipment for the metalworking industry.

From the wealth of engineering talent through its member companies, the Association draws its Technical Committee, an extremely active group which guides the technical activities of RWMA and oversees its research projects.

The development of standards for the industry has always been a major and continuing interest of the Technical Committee. RWMA has developed complete mechanical and electrical standards for resistance welding machines, which are continually reviewed and revised to include developments and progress throughout the welding field. They can be used as a basis for writing specifications in order to insure quality and maximum machine interchangeability.

Standards for resistance welding transformers, as established by RWMA, have been recognized and adopted verbatim by the Joint Industry Conference. RWMA has also worked

continued on page 97

Circle No. 2 on Reader Service Card.——→

Indicator at top of protective housing indicates a full cylinder.

Cylinder content indicator at half-full position.

Read working pressure directly from micrometer markings engraved on dial. Regulators for oxygen and acetylene service are available.

All new...accurate...and toughest yet! Airco Gaugeless Regulators ...backed by the *most experience*

The new Airco Gaugeless Regulators for oxygen and acetylene give you the *pressure accuracy* you need, plus the *ruggedness* that regulators should have for construction and maintenance work, where rough handling is constant fare. That's because of the regulator's protected cylinder content indicator, and adjustable micrometer working pressure dial.

These rugged regulators are the newest in Airco's extensive quality line . . . two more examples of how *Airco experience* brings you better welding equipment. Whether you need regulators, gas welding and cutting equipment, tips, supplies or industrial gases – your nearby Authorized Airco Distributor has them in stock. Look in your Classified Telephone Directory, under "Welding Equipment and Supplies," for your nearest Authorized Airco Distributor.

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You won't break 'em off when you weld with...

Tooth with re-pointer welded on with manual Stoody Nickel Manganese—iron powder coating. Hard-facing on upper part of tooth is still in good condition.

new **STOODY NICKEL MANGANESE**

Iron Powder Coating

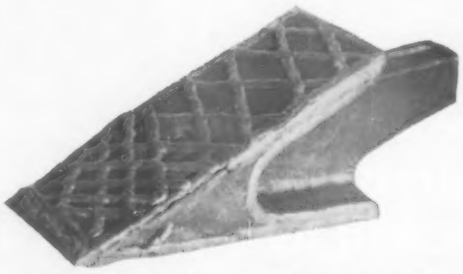
Wherever you need manganese give this new Stoody electrode a try! Stoody Nickel Manganese with iron powder coating is designed for both *strength welds* and *build-up*. Makes fast, dense deposits with smooth arc action. Slag lifts easily leaving clean, bright metal ready for multiple passes.

Strength? Just check these physical properties based on tests by an independent laboratory.

PHYSICAL PROPERTIES

	DC Straight Polarity	DC Reverse Polarity
Tensile Strength	119,000 psi	111,000 psi
Yield Strength	67,000 psi	66,000 psi
Elongation in 2"	55%	37.5%

Hardness—Single pass on manganese steel; as deposited—15 R_C; as work-hardened—48 Rc.
Two passes on manganese steel; as deposited—18 R_C; as work-hardened—48 Rc.



HARD-FACING ADDS EXTRA TOOTH WEAR

Cross-hatch of manual Stoody 21 is applied over point. Point had two passes of Stoody Tube Borium applied manually to provide utmost protection in this area of severest wear.

If you *join* manganese parts or *build up* worn manganese equipment, make a test of Stoody Nickel Manganese now! Your Stoody Dealer has it in stock. For nearest dealer see the "Yellow Pages" or write direct.

STOODY COMPANY

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JUNE, 1960
Welding Design & Fabrication
ESTABLISHED IN 1930 AS INDUSTRY & WELDING

COMPLETING THE SPACE FRAME pattern, short sections are raised between cantilevered ends of sections, already in position.

Production Line Fabricating And Welding A 1,200-Ton Steel Space Frame

IN BRIEF: Welded angle space frame construction is the most economical and practical way to get desired architectural effects.

PRODUCTION LINE fabricating and welding made over 200 sections for one of the biggest space frame roofs in the country. The roof contains 1200 tons of steel frames and measures 450 x 450 feet. It crowns a new 450-foot square office building built at Kalamazoo, Michigan for The Upjohn Company.

Steel fabrication and erection was done by Whitehead & Kales Company, Detroit. Skidmore, Owings and Merrill did the designing.

CONSTRUCTION

The designers considered the frame construction (technically they call them "space frames") the most economical and practical for getting the architectural effect they wanted. They studied a dozen different techniques, including steel pipe, before settling on welded angle construction.

Whitehead & Kales fabricated a pilot model and erected it near the building site. Then they tested every critical joint to failure before fabrication started.

NEED 150,000 ANGLES

In bidding the steelwork, Whitehead & Kales planned to run the entire roof through its shop on a production line. Over 150,000 4-foot lengths in various size angles were needed for the pyramid corners. Another 15,000 various lengths of structural tees were needed to form the horizontal framing.

Whitehead & Kales, known for years for its structural work in the Midwest, also mass-produces automobile haulaway trailers, railroad car loading devices, and materials handling racks. They naturally looked at the space frame project from a production-line viewpoint.

The firm settled upon fabricating the over 200 trapezoidal, triangular and parallelogram sections in their shop, then shipping them to Kalamazoo for rooftop assembly. Each truck load consisted of two or three space frame sections along with beams and columns to bring the load to full allowable weight.

WOOD MOCKUP SIMPLIFIES FABRICATION

In their shop, W&K built a full scale wood mockup of one of the space frame roof sections. From it, the engineers studied all angles, clearances, weld joints and welding techniques. Then they made wood models of the welding and assembly fixtures to hold tolerances to 0.01 inch. This is fairly tight compared to normal structural tolerances. These tight tolerances avoided the reaming and fitting that usually goes with bolted field erection.

W&K made their own structural tees, used as horizontal members of each space frame section. They slit from wide flange beams rather than buy them as mill shapes. A punch press with rectangular punches and an automatic spacing table slit the beams. As a beam was indexed through the press, a series of slugs was knocked out down the beam's center. No slug was knocked out at specified intervals. The two resulting tees were not completely separated. The sections were later sawed and tees cut to length to serve as the chords of the upper and lower space frame grids.

TWO TYPES OF JIGS AND FIXTURES

A grid subassembly jig and a final assembly jig held the space frame sections during welding.

Grid subassembly jigs positioned tees for assembling the top and bottom grids. Connector plates also were positioned and welded in these jigs.

In the final assembly jig, a completed bottom grid was put in place, diagonal angles laid in loose, and the top grid lowered to a resting spot on spacer columns in the jig. Locking devices held the top grid in its exact relationship to the bottom grid. Then, diagonal running angles between the top and bottom grid were tacked in place, and downhand welds made on the entire assembly. The partially welded section was then rolled over by hoist into a cradle. Here the balance of the welds were completed by downhand welding.

Completed frame sections passed through the paint shop and into the storage yard for shipment.

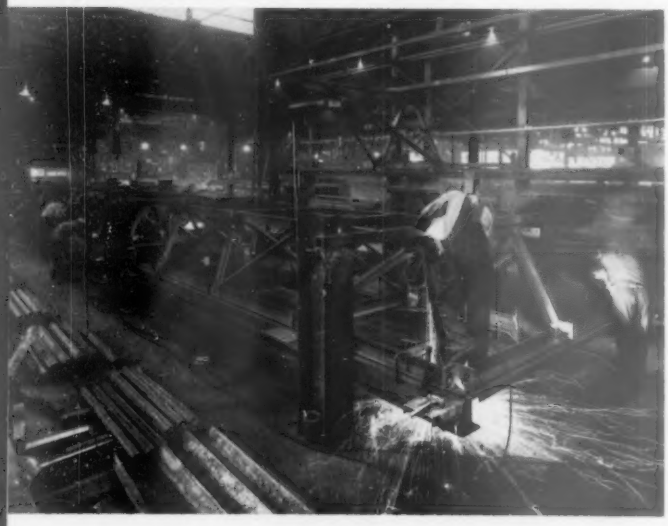
ERECT SECTIONS ON FALSEWORK BEAMS

The designers specified table top erection at the job site to get perfect alignment of the sections. In this method a series of false-work beams were bolted to roof supporting columns for temporary alignment and positioning of space frame sections were temporarily aligned and positioned on them. A number of space frame sections were placed side by side on these beams. Then they were joined with diagonals already attached to the top chord of one section and ready to pivot down to meet the next section's bottom chord.

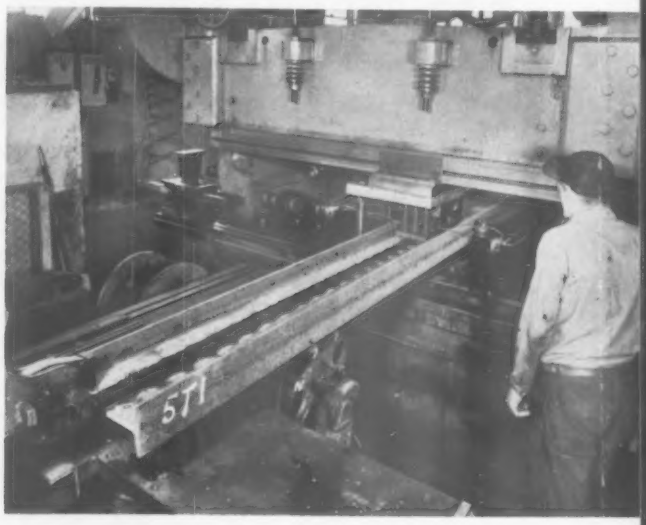
After joining a series of long frames, they raised the suspended sections into position between cantilever ends to complete the pattern. Falsework beams were removed after completion of the roof over one bay, and then moved to another bay.

A new expansion joint was used in joining end-to-end sections. Instead of the customary bolt-in-slot, a square bar slides in a slot. The bolt fits into the bar, rather than into the slot, avoiding point contact. • •

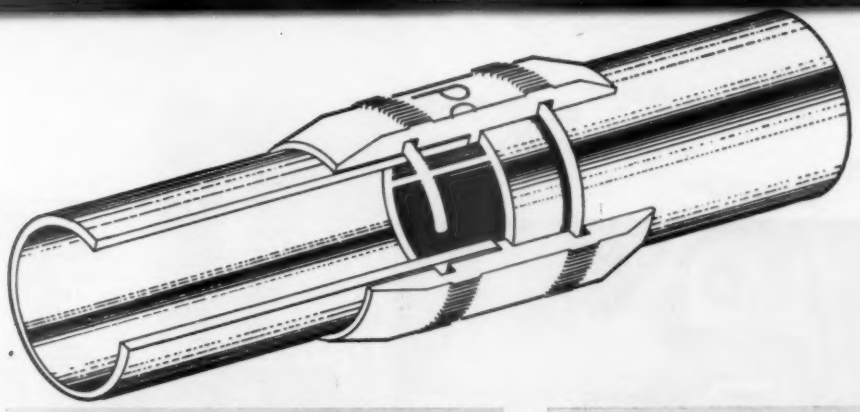
TYPICAL PRODUCTION LINE JIG is this final assembly jig where top and bottom grids of a space frame section were properly positioned by columns, then diagonal running angles welded in place.



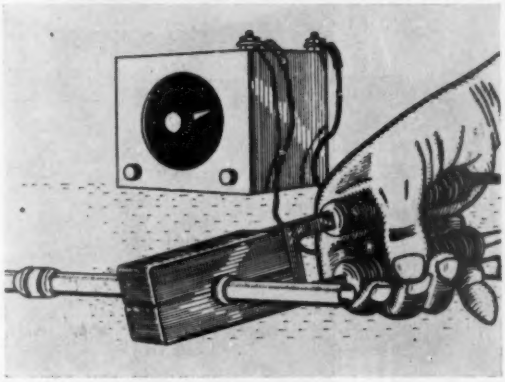
STRUCTURAL TEES were slit from wide flange beams. This punch press knocked out a series of slugs, leaving small sections at intervals. These sections were sawed, then tees cut to length.



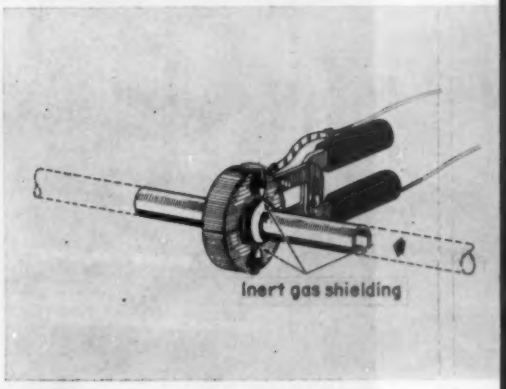
this connector . .



and these tools . . .



RESISTANCE PLIER has electrode on each jaw; timer cuts off current after connection is brazed.



INERT GAS protects metal and promotes flow; corrosive fluxes are out.

Better Fluid Lines With Brazed Fittings

by **D. F. COLLINS,** *chief engineer, Aircraft & Missile Fitting Div., Parker Aircraft Co., Los Angeles*

IN BRIEF: Connections in hydraulic lines need be potential leakers no longer; resistance and induction brazing are the most promising methods of making strong, reliable joints.

CONNECTIONS in hydraulic lines are going to change. Traditionally mechanical, new methods are coming along that will improve the reliability of these joints; leaks will be practically unheard of.

The most promising way to make permanent connections in fluid lines is brazing. A typical connection is shown above. You insert the tubes in the connector and heat it with a brazing tool. The brazing alloy is a ring in the fitting.

Aircraft and missile lines have to withstand different pressures and temperatures. Brazing filler metals have been developed to meet these conditions. There are alloys that will perform well anywhere from —425 to 1000 F.

What are the advantages of brazed connectors and fittings?

- They don't depend on torque or precision mating surfaces.
- They are much lighter than other fittings.
- Their strength often permits the use of fluid lines as structural members.

Production techniques have a great deal to do with the success of brazed fittings. Two brazing techniques that are fast and dependable are induction and resistance.

Induction brazing provides the quickest and most uniform heat of the two. The joint is surrounded by a high-frequency induction coil. Eddy current losses within the fitting produce the brazing heat.

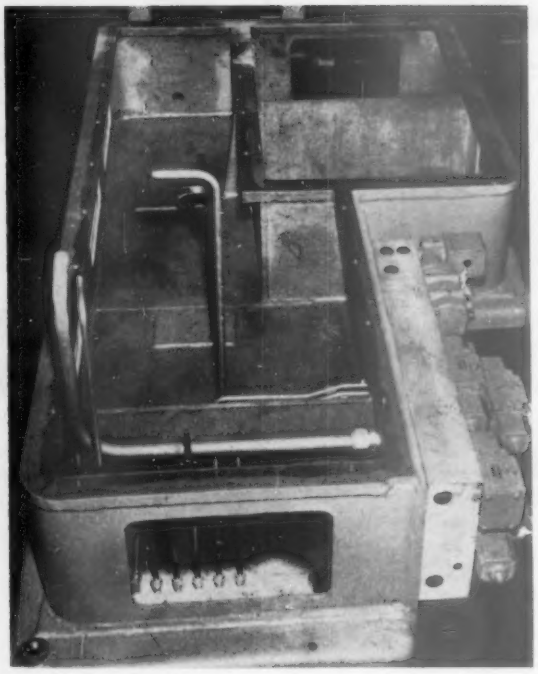
In resistance brazing, a high current is passed through the fitting. Resistance is much higher at the mating surfaces than it is in the rest of the parts; most of the heat centers there. This melts the brazing alloy to form a leakproof joint.

Fittings are resistance-brazed with plier-like tools. Each half of the plier is an electrode. Both halves encircle the connector and heat it until a built-in timer stops brazing current.

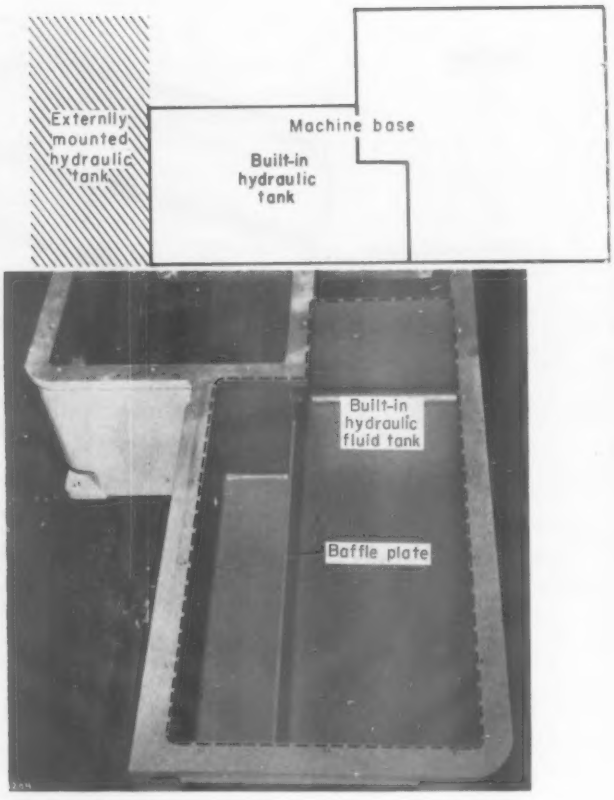
For induction brazing, a high-frequency coil encircles the connector. A timer stops current flow when the braze is made.

Some brazing alloys won't flow and penetrate without help. In other brazing jobs a flux does the trick. But in an aircraft or missile line, flux that couldn't be removed would corrode and contaminate.

To avoid the drawbacks of flux, an inert gas like argon is used inside and out. This shield not only promotes flow of the brazing material, it also prevents oxidation. • •



BOTTOM HALF of base, with easy-to-machine mounting pads, and easy-to-assemble tubing is bolted to . . .



UPPER HALF of base, called bed, which contains the built-in hydraulic fluid tank with stiffening baffle.

Good Machine Design: Saves $1,600, Takes A Quarter Less Space

IN BRIEF: This welded milling machine won a design award: It took less time to make, it needed less space, and it performed better than other designs.

FAST DELIVERY, better performance: the goals set by the Cleveland Twist Drill Company in making five-tracer controlled milling machines. They reached both goals with welded design. What's more, they made important savings. Moreover, the design engineers on the job, Robert L. Nekola and Howard C. Seabeck, won an award for the design in the James F. Lincoln Arc Welding Foundation's Machine Design Award Program.

These were the savings:

- Money. Fabricated and welded steel construction saved $1,000 on each machine base.
- Money. By welding other components, an extra $600 was saved on each machine.
- Space. The machine required a quarter less floor space because they made the hydraulic fluid reservoir part of the base, not separate as usual.

They designed the machine base in two parts: the base section (lower), and the bed (upper). Welded to these were inside flanges so the sections could be bolted together in final assembly. The combination had clean-cut lines, something that castings would not have had; the flanges would stick out if cast.

The 2-piece design made machining easier and cheaper too. Hydraulic cylinder mounting pads on the underside of the bed section would have been very difficult to machine if the base were cast.

Time was saved in installing tubing in the 2-piece design. It took a third less time, because the assemblers had a big work opening instead of small side openings. It took less tubing too. The plate construction served as an anchor *and* a manifold for hydraulic feeder lines. And having the hydraulic tube inside the tank eliminated a safety hazard. If there were a leak, the fluid would drip into the tank, not on the floor.

Making the 60-gallon hydraulic tank a part of the machine base was a brilliant idea. Not only did it reduce floor space, it saved over half the cost of an external tank. The sides and bottom of the base formed three sides of the tank. • •

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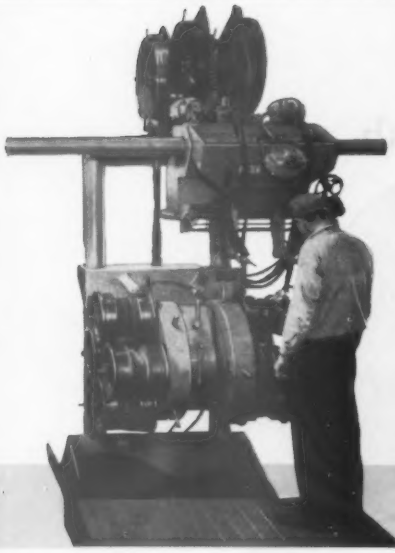

ROLLER AND IDLER REBUILDER
VICTOR MODEL "DEMS"

A big money-maker for anyone rebuilding tractor rollers and idlers on a production basis. Double-ended, multiple spindle mounts 8 track rollers, or 2 idlers, at a single loading. 360° rotation permits rebuilding all faces and flanges without additional handling. Automatic move-over assures uniform build-up. Dual wire feed cuts rebuilding time in half. Comes complete with power-saving power unit, specially engineered for automatic welding.

ROLLER FLANGE
FLAME HARDENER

prevents flange wear and roll over (cause of many premature failures) by flame hardening renewed area to approximately 50 Rockwell C. Dual torches flame harden both inside and outside of flanges simultaneously.

Save yourself a barrel of MONEY with these VICTOR Rebuilding Machines

. . . manufactured by internationally known L&B Welding, Inc., now a wholly-owned subsidiary of Victor. Hundreds in use by world's leading tractor dealers. Let us show you how you can profitably renew track rollers, idlers, links, and crushing rollers with these proven machines. Help on shop layout, installation and training of your personnel available from factory experts. For complete story see your Victor dealer...or write us for descriptive literature.

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Los Angeles 58

1145 E. 76th St., Chicago 19
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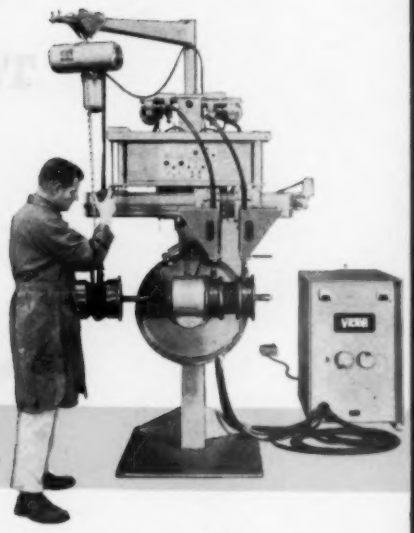

Economy Size
ROLLER AND IDLER REBUILDER
VICTOR MODEL B

Ideal for contractors and small repair shops. Produces same high quality work as larger Model DEMS, but mounts only two rollers or idlers at a loading. Has same type double wire feed, automatic move-over, and motorized positioning of work. Built-in jib crane (rated ¼-ton capacity) enables operator to handle rollers and large idlers with ease. Price includes power supply.

VICTOR FLUX GRINDER

processes 1500 pounds or more of fused flux per hour with very low flux loss. Sizes flux to factory specifications. Savings made by reclaiming only 12,000 pounds of flux returns low initial cost of grinder.

VICTOR for hardfacing

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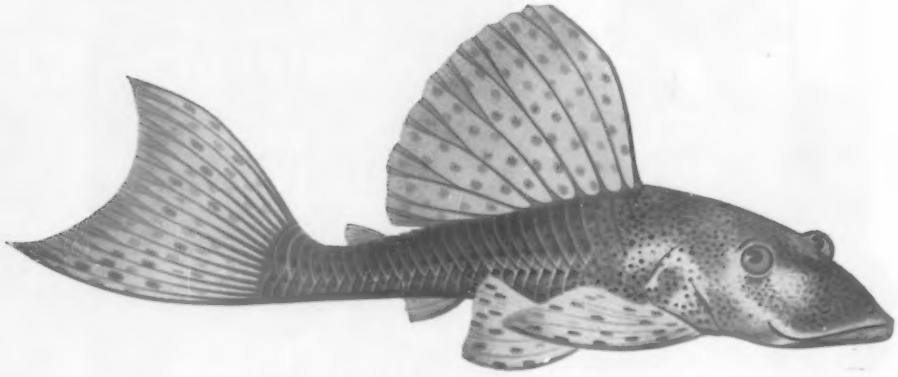
To identify a strange fish...



you call in an *ICHTHYOLOGIST*

(specialist in fish life)

to cut production costs...

you call in *LINCOLN*

(specialists in arc welding)

BECAUSE of high operating costs a Maryland barge builder had trouble meeting competitive prices. The LINCOLN Field Engineer recommended a semi-automatic "Squirt" welder. On heavy plate it was four times faster and reduced overall costs due to reduced plate preparation and cleaning time.

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That's why we say it's a good idea to do business with LINCOLN where arc welding is a specialty and cost reduction comes to you as a "plus" at no charge.

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LINCOLN WELDERS

For More Information Circle No. 51 on Reader Service Card.

Part 2 of 3

How To Weld Molybdenum

This metal is strong at elevated temperatures and has high elasticity. That's why it's being used more and more in jet-age applications

MOLYBDENUM IS WELDED in this vacuum-purged controlled atmosphere chamber.

IN BRIEF: Arc welding is discussed in this second of a series of three articles. Next month: resistance welding.

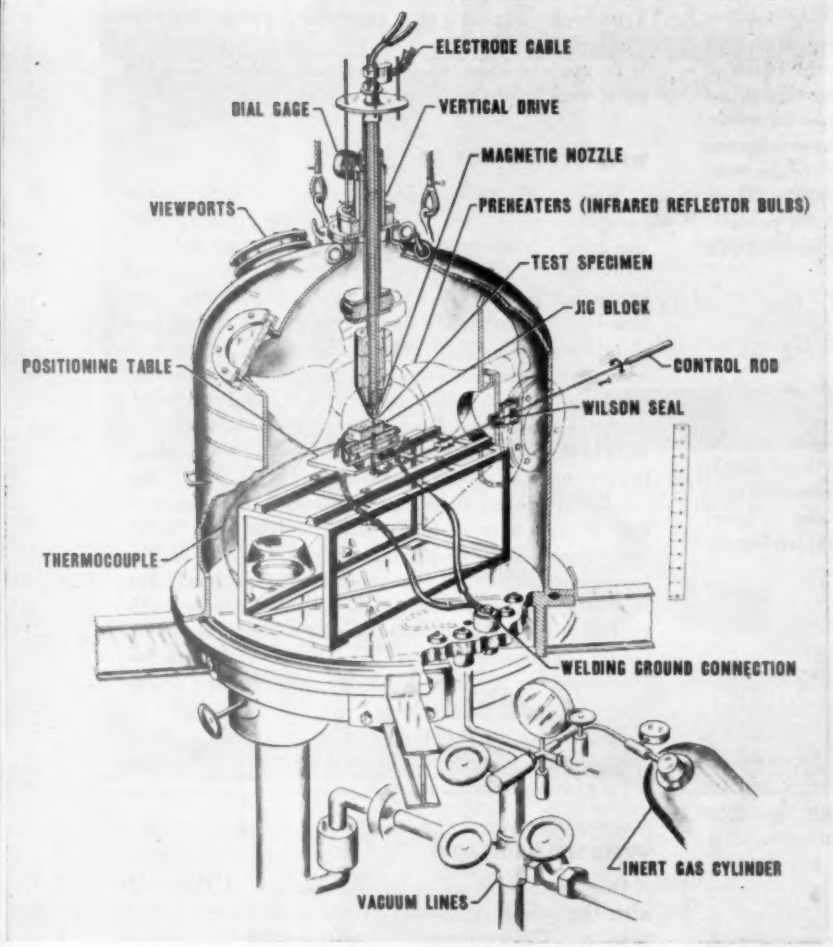
THE HARDEST PART of welding molybdenum is to prevent oxygen pickup. Let's discuss the ways to do this.

First, weld in a controlled-atmosphere chamber whenever you can. This is the best way to prevent contamination. Chambers come in styles suitable for manual or automatic welding. They should be vacuum purged. Flow purging and purging them by collapsing them is often not good enough for welding molybdenum. For very critical welds, the best bet may be to weld in vacuum.

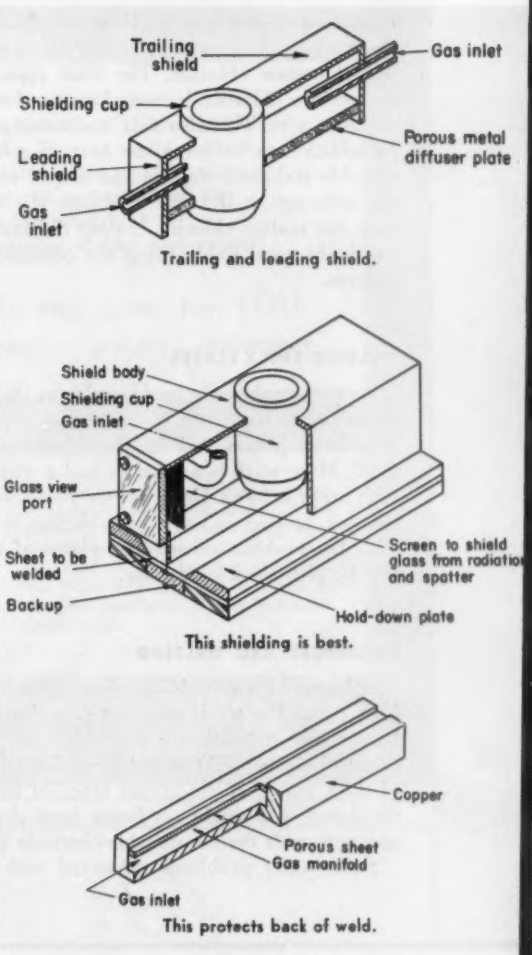
If welding cannot be done in a chamber, then it must be done in the open. This calls for adequate shielding. Some molybdenum welds have been made in the open by using a standard tungsten-arc torch shielding cup. These welds have been reasonably successful. But, it is better to use some device which assures better shielding. One device is a cup combined with a trailing and leading shield. The shielding cup supplies gas to shield the molten weld pool. The trailing shield provides gas to protect the rear of the pool and the hot weld metal behind the pool. The leading portion of the shield provides gas to prevent oxidation of the surface of the molybdenum ahead of the weld pool. This leading shield is important because molybdenum's high thermal conductivity conducts heat rapidly ahead of the pool without shielding. The heated metal surface may oxidize seriously. A porous diffuser plate insures steady homogenous flow over the whole shielding area.

The best movable shielding device is a standard shielded cup fitted with a box which slides on the hold-down plates or on the part to be welded. If the box has a glass window, you can see ahead of the weld area. It is important for the dragging shield to fit as well as possible. Pieces fit down into the recess between the hold-down clamps. Without these, there is too much chance for gas to diffuse back into the shield area.

Protect the back of the weld from contamination. If a backup is being used, it is important that it be one



AUTOMATIC WELDING in vacuum-purged controlled-atmosphere chamber.



ADEQUATE SHIELDING is needed in open air.

that provides even and complete shielding. One such backup is made of copper and has a porous metal sheet inserted to provide even, constant flow to all parts of the weld. If the weld is being made on a part that is closed, or if the weld is being used to close something, purge the inside of the part with gas and use a gas backup.

An example of this is in welding of tubing. One way is to plug the ends of the tube; use an excess pressure of argon in the tubing; let it flow through the unwelded portion of the seam.

With proper procedures you can make good welds without a controlled atmosphere chamber. To prove this we made two groups of welds. We made the first group in a controlled-atmosphere chamber. The second group was made in air. We made bend tests at 25°C and at 75°C on the two groups of welded specimens. The important data are for the tests made at 25°C. This is around room temperature. If a weldment is ductile at this temperature, it probably can be handled through a manufacturing process.

If we were to compare all of the like specimens, we would find that consistently the open-atmosphere welds had significantly lower average bend angle than those made in the dry box. Remember, however, that room-temperature ductility in a molybdenum weld is something which has only been achievable for the past two years or so. Consequently, the results obtained on the open-atmosphere welds can be considered quite good. They probably would be much better had a trailing-leading shield or a dragging shield been used.

CONSUMABLE ELECTRODE WELDING

Some welding of molybdenum also has been done using the inert gas-shielded consumable-electrode welding process. This process suffers from excessive spatter and an erratic unstable arc. Both of these produced poor welds. The spatter particles welded fast to the plate and were extremely hard to remove. They were quite large so they couldn't be ignored. The erratic arc made it hard to produce consistently sound welds and to produce welds with acceptable shapes.

A considerable amount of work was done to try to

develop gas mixtures which would improve arc stability and reduce spatter. However, the only effective thing was to coat the filler wire with an emissive coating of cesium chloride. The most apparent effect of the cesium chloride is to reduce the burnoff rate of the filler wire. This also aids in obtaining better welds. In addition to reducing the burnoff rate, the cesium chloride stabilized the arc and helped to reduce spatter, although it did not eliminate the spatter. However, the cesium chloride coating did make it possible to obtain good welds using the consumable-electrode process.

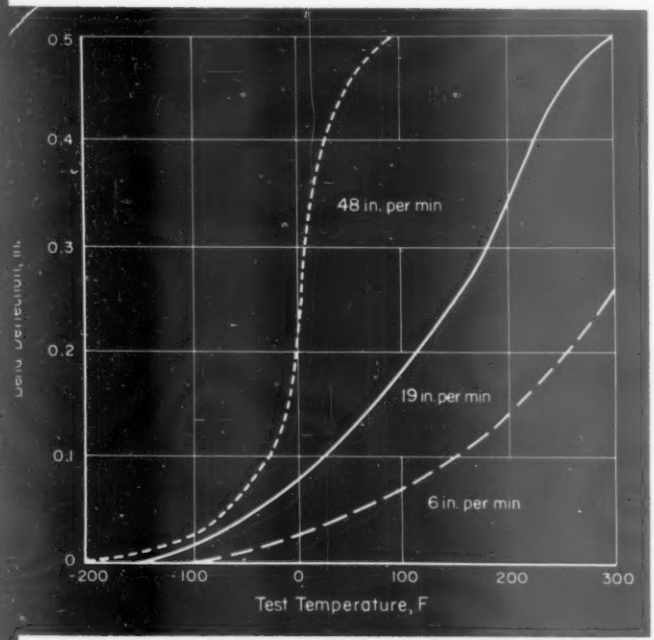
WELDING THICK PLATES

A consumable electrode weld in ¼-inch molybdenum plate was made in two passes. It gave us some very large grains and its shape was not all we desired. More work is needed to find a way to get beads with lower crowns. However, the consumable-electrode welding process is worth considering if one is faced with the problem of welding plates of molybdenum, say ¼ inch thick or thicker.

SUBMERGED ARC WELDING

Submerged arc welding of molybdenum also has been tried. The welds were not very ductile. However, better base materials are available now. It seems that this technique might also be considered for welding of thick plates. If the proper types of fluxes could be developed, you might get better bead shape than you can now with the consumable-electrode process.

Some other problems connected with arc welding are worth mentioning. In the past, porosity was always a problem. Probably it's caused by the reaction of carbon and oxygen to form CO. The way to avoid it is to use a deoxidized molybdenum and to clean the parts well before welding.



WELDS MADE AT HIGHER speeds have appreciably higher bend ductility at room temperature.

WELD METAL CRACKING

Weld-metal cracking is common. The cause is the combination of the brittleness of the material and the great shrinkage due to the high melting point of molybdenum. Cleaning parts well before welding and protecting them while welding helps reduce cracking. Cracking is most likely in the crater. This means you should use a welding tab at the finish end of the weld whenever possible. Stress relieving can help prevent cracking. Stress relief of 1800°F will eliminate residual stresses in molybdenum welds in 4 to 5 hours. If a weld is made and stress relieved before it cools to some temperature at which it becomes brittle, no crater cracks will form. In the past, stories have circulated that it was impossible to make molybdenum welds over some certain length. This length varied with the telling. Sometimes, it was as short as 6 inches, other times as long as 18 inches. Battelle has made longitudinal seam welds in molybdenum tubing 6 feet long without encountering cracking. Consequently, we believe cracking is eliminated by proper handling of the molybdenum during welding.

In addition to prevention of oxygen pickup, there are two things which can be used to improve the ductility of molybdenum welds.

GRIND WELD SURFACES

One of these is to grind the surface of the weld after the weld is completed. Welds which have no ductility at room temperature in the as-welded condition will bend as much as 40° in a simple bend test after the surface is ground. It is believed that the improvement in ductility by grinding is obtained by removing contaminated surface layers on weld and heat-affected zone and by removing ripples and other markings on the surface of the weld.

WELD FAST AS POSSIBLE

The second way to improve the ductility of arc welds is to weld as fast as possible. Increasing welding speed lowers the brittle transition temperature. However, the important effect from a fabrication viewpoint is that the welds made at higher speeds do have appreciably higher bend ductility at room temperature.

The second possibility of improving ductility of arc welds is to use molybdenum-rhenium alloys as filler metals. It appears that these will eliminate the weld-metal brittleness problem, although their use as filler metals will have no effect on heat-affected-zone ductility. The problem with these alloys may be to get the rhenium from which to make them. • •

EDITOR'S NOTE: This material is based on a paper presented by D. C. Martin of Battelle Memorial Institute at a recent ASM Woodside Panel Conference.

For More Information Circle No. 25 on Reader Service Card.

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*says Ben Ruff of Reed & Graham, Inc. "Before I had to change holders whenever the one I was using would get hot. Now, with DURO, I can weld a whole shift without the holder getting hot to my hand, even when using 5/16 in. hardfacing electrodes at high amperages."

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THE DURO "STANDARD"

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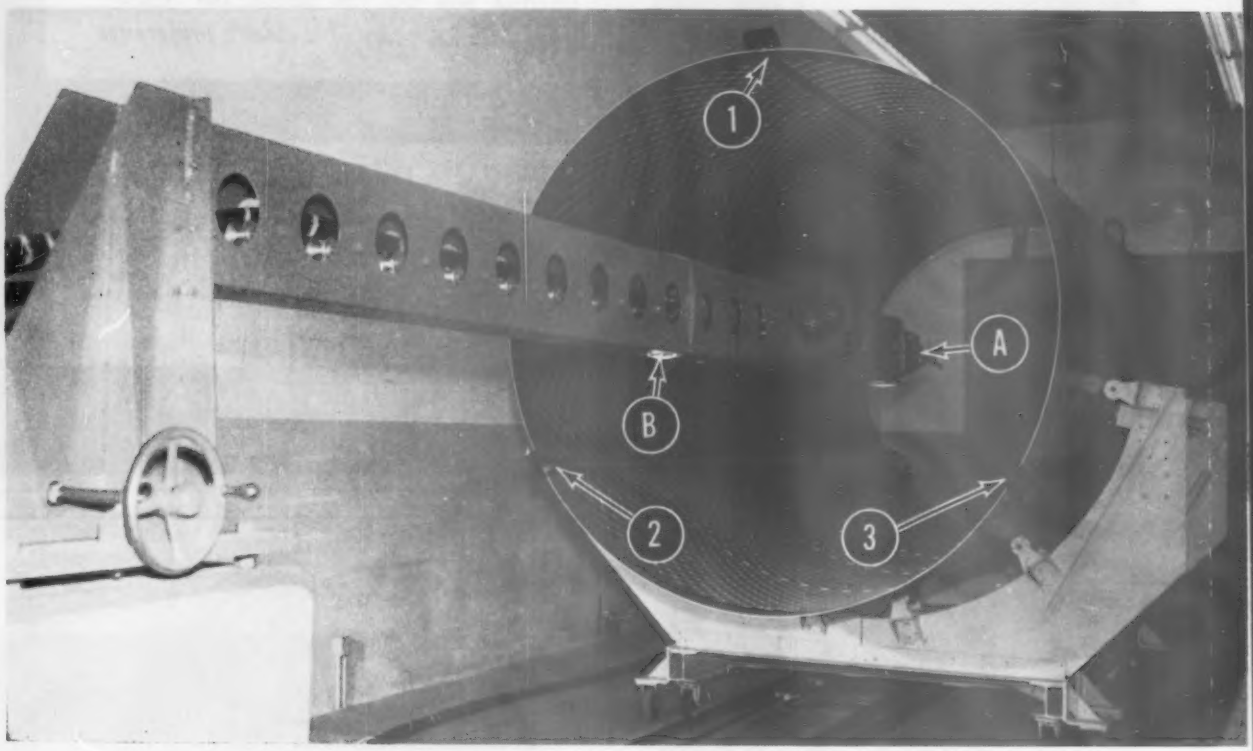
Get the lion's share of meaty facts out of this issue of WELDING DESIGN & FABRICATION before you pass it along to the next reader. Leaf through once more: If you want full details on any item, the Reader Service Card will bring them to you quickly. No postage needed.

In-Motion X-ray Speeds Inspection Of Large Tank Weldments

by W. C. HITT and D. J. HAGEMAIER, *Douglas Aircraft Co., Santa Monica, Calif.*



TWO X-RAY TUBES, A and B, take three longitudinal weld seams, 1, 2, and 3, at the same time as the remotely controlled, powered carriage moves the tank passed the tubes at 6 ipm.

IN BRIEF: On-time delivery of missiles forced a speed-up in radiographic inspection of components.

IF THERE WAS A WAY to x-ray large tank weldments faster, we wanted it. Our contract for Thor Intermediate Range Ballistic Missiles clearly and inflexibly showed the need for speed in the words: Deliver on time. It went farther. We had to have good radiography standards.

It was clear to us that ordinary x-ray was not practical. It was good but it was slow. So we hit on something new: X-ray the weldments *while they moved.* In-motion x-ray, as we called it, was much faster than standard radiography and the quality just as good. Our program began to roll.

First, we built the x-ray lab consisting of an exposure room, a control room, and a dark room. We bought some equipment, and made some we couldn't buy. For example, you couldn't get packaged 70-mm. film, so we built a machine to cassette rolls of it.

Our setup had a fixed boom to hold the x-ray tubes and a powered carriage (on tracks) to feed the tank cylinders by the x-ray tubes. We made tanks in two lengths. One 188 inches long, the other longer. Both were joined with three longitudinal welds. We x-rayed all three welds at once by restricting the 360-degree beam of each tube with lead ports. The three ports masked the x-rays, yielded three 1- by 8-inch beams (at a 48-inch focal-film distance). We made the ports thick enough to mask the x-rays at our operating voltage. Beam width, we found, depends on five things: focal-film distance, material thickness, voltage, amperage, and speed of travel.

LEAD PORTS on rod-anode x-ray tubes restrict full circle rays to three 1- by 8-inch beams at 48 inches focal-film distance.

CIRCUMFERENTIAL WELDS are radiographed in one exposure with the boom-end tube, and no lead port restriction.

IN-MOTION X-RAY SAVES OVER 7 HOURS A TANK

Longitudinal welds

	Conventional technique, hrs : min	In-motion technique, hrs : min
Exposure and set-up time	2:50	0:35
Film processing	3:00	1:30
TOTAL	5:50	2:05
SAVED	3 hrs 52 min per tank	

Circumferential welds

	Conventional technique, hrs : min	In-motion technique, hrs : min
Exposure and set-up time	2:30	0:12
Film processing	2:30	1:30
TOTAL	5:00	1:42
SAVED	3 hrs 18 min per tank	

IN-MOTION X-RAY STUDIES

Material	Thickness in.	Length ft	KV	MA	FFD in.	in./min.	Film
2014 AL	.375	20	90	15	48	6.0	EK-AA
2014 AL	.375	15	90	15	48	6.0	EK-AA
4340STL	.090	12	150	3.5	18	4.0	EK-AA
4340STL	.065	6.5	140	3.5	18	4.5	EK-AA
4340STL	.150	14	160	4.0	20	3.5	EK-AA

SMALL ASSEMBLIES are x-rayed with ordinary equipment in the same exposure room. Parts are stationary when shot.

We used two 150-kv heads to double our speed. One head was at the end of the boom, the other, half a tank length behind it. This way we were able to shoot all three welds by moving the tank just half its length. Two positions for the middle tube made it possible to x-ray both tanks on this set up.

When the operator pushes the starting button in the control room, x-rays penetrate the welds and the carriage moves 6 ipm. When the tank has gone slightly more than half its length, a limit switch shuts off all power. Then another control returns the carriage to the starting point. On the way back, technicians strip the film and markers from the tank and develop it.

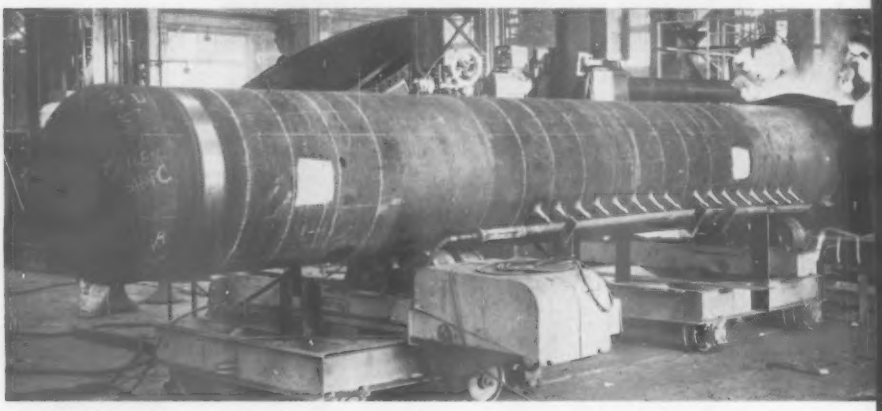
ONE EXPOSURE ON GIRTH SEAMS

When we x-ray circumferential welds we don't restrict the beam. We want the full circle to do the circumferential seam in one exposure. We tape a 25-foot strip of 70-mm film over the outside of each weld seam. Then we center the boom-end tube under a seam and shoot, move the carriage, shoot the second seam. Fortunately, each bulkhead has an opening big enough for the boom to get through.

There's no question, in-motion radiography has done a job for us. It's fast, economical, and easier to standardize than the conventional way. Our first installation for aluminum weldments was so successful, we installed another for steel. The newest one had a boom adjustment to accommodate several tank sizes.

For smaller assemblies we use ordinary x-ray equipment. Nothing moves. And as a final test of all welds for surface defects we use penetrants for aluminum tanks and magnetic particle inspection for steel. • •

BEFORE WELDING, two high-strength alloy steel guide rail subassemblies are clamped back-to-back to keep them straight, and preheated to 300F. Interpass temperature is 350F.



HYDRAULIC RAM is welded with low-hydrogen, low-alloy high-tensile steel electrodes. After welding, the ram will be stress relieved for dimensional stability.

U. S. S. Kittyhawk gets her heaviest jets in the air—fast—no matter what the weather's like. Here are the reasons . . .

Welded Elevator Engines Are

IN BRIEF: Few welded fabrications have a tougher role than an aircraft carrier's hydraulic elevator engines. Welding permits the designer to put the best material where it will do the most good.

HYDRAULIC ENGINES, built for carrier U.S.S. Kittyhawk by the Baldwin-Lima-Hamilton Corporation of Philadelphia, do more than yeoman service for the Navy. They power the elevators that raise and lower the largest and heaviest aircraft between hangar and flight decks.

The elevator platforms are located on the edge of the carrier deck. They are connected to horizontal hydraulic engines just inside the hull by steel cables through sheaves. Movement of the hydraulic ram shortens or lengthens the cables, raising or lowering the platform. The platform is guided by rails supported by the ship's structure; rollers on the platform follow channel rails fitted with wear plates.

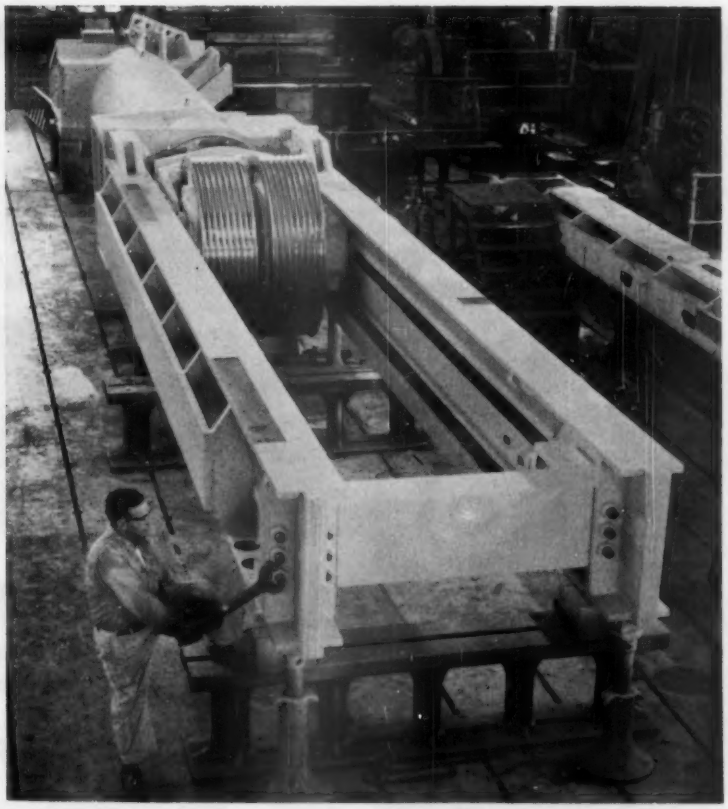
The demands on the elevators and, in turn, the cables and hydraulic motors, are formidable: stresses and pressures are high; there's high and low temperature shock; operating loads are heavy; wind and sea forces extreme.

MATERIALS CAREFULLY SELECTED

The hydraulic engines are built to absorb these loads without balking. They're big; the ram is 38½ inches in diameter and over 18 feet long. They were designed for minimum weight with maximum reliability. Welded design was largely responsible for this. It permitted use of a variety of materials so that each part performed as many functions as possible and each contributed to the success of the completed weldment. B-L-H Design Engineer, Thomas Tomaino, says, "We analyze each material more for what its properties can contribute to the finished design than for the numerical values of the properties, such as yield strength and weight."

The tough, high-strength heat-treated steel of the hydraulic engines needed careful welding and stress-relieving. B-L-H preheated the weldments to 300°F during welding until stress relieved. Pyrometer leads, near the weld joint, enabled the operator to know the

ASSEMBLY of ram in cylinder requires one of B-L-H's tallest bays.



FINAL STEP: The hydraulic engine is completely assembled on a giant surface plate to make sure that the components fit properly and operate as they should.

Built To Take It

interpass temperature.

The company used manuel shielded arc and submerged arc processes. All welding conformed to the ASME Boiler and Pressure Vessel Code, and the Navy Specifications covering ships. The welding operators were qualified under the ASME code and B-L-H process specifications. Wherever possible, B-L-H positioned rails, cylinders, and rams for downhand welding.

49 DIFFERENT WELDING JOINTS

The joints were made in plate of from ½ to 4¾ inches thick. Their preparation was much more exacting than an ordinary job; a weld failure might be disastrous to a carrier. There were 49 joint designs on the cylinder, ram, side rails, sheave pedestals, and stops. Typical were fillet joints; J-grooves for joining 3-inch plate to another member by manual welding; and J-grooves for joining 4-inch plates by automatic submerged arc welding. The B-L-H welding procedures for hydraulic engine assemblies includes detailed sketches showing material thickness, joint design and fitup, and welding sequence for multiple passes. The designers specified J-grooves, bevels, and V-grooves, but not U-grooves. This was aimed at limiting the number of weld passes, therefore, heat input, and warpage. Labor and filler metal costs were less too.

By following these preparation and welding ground rules, B-L-H operators were able to make high quality welds time after time:

1. Clean joint thoroughly.
2. Strike arc only in the weld groove.
3. Get good penetration on the first pass.
4. Clean each deposit thoroughly.
5. Butt joints welded from both sides: remove root by chipping, grinding, or carbon-arc-air-gouging. Check for complete removal of root by magnetic partical inspection before welding the root side.
6. Finish welds must be free of overlaps, base metal free from undercutting. Fill all craters to full cross-section of the weld.

After welding, B-L-H stress relieved the still-hot weldment at 1225 F, then let it cool in the furnace. Stress relief was important for two reasons: it prevented stress corrosion and maintained dimensional stability during machining.

Final processing included shot blasting, visual and magnetic particle inspection of welds, and radiographic inspection of welds. The radiographs had to meet Navy Standards for production and repair welds. • •

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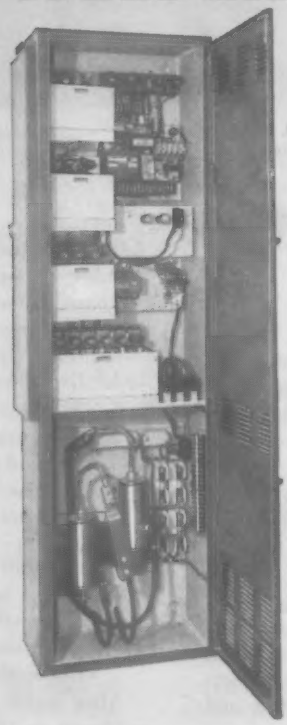
Square D Welder Control proved itself in production by increasing speed, adding to the strength of the welds and reducing repairs

SQUARE D *Electronic* WELDER CONTROL



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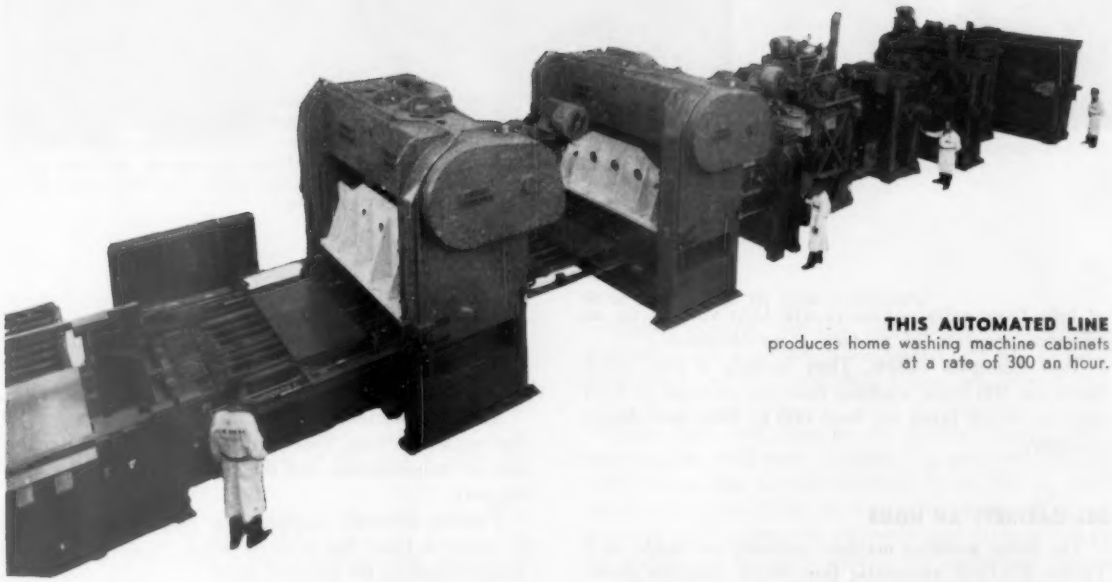
NEW DEVELOPMENTS FOR RESISTANCE WELDING are featured in the application-type articles which follow. These will show you how industry is using the latest resistance welding equipment and processes. Following these articles you'll find a complete section describing the newest resistance welding equipment, accessories, and supplies.



THIS AUTOMATED LINE
produces home washing machine cabinets at a rate of 300 an hour.

Automation Of Spot And Seam Welding

AUTOMATED RESISTANCE WELDING lines that do everything but sell the products they make.

That's what more and more companies will be using to increase production and cut costs.

Here's a check list developed by WELDING DESIGN & FABRICATION editors to tell you what welding users should know about this important, relatively new production tool.

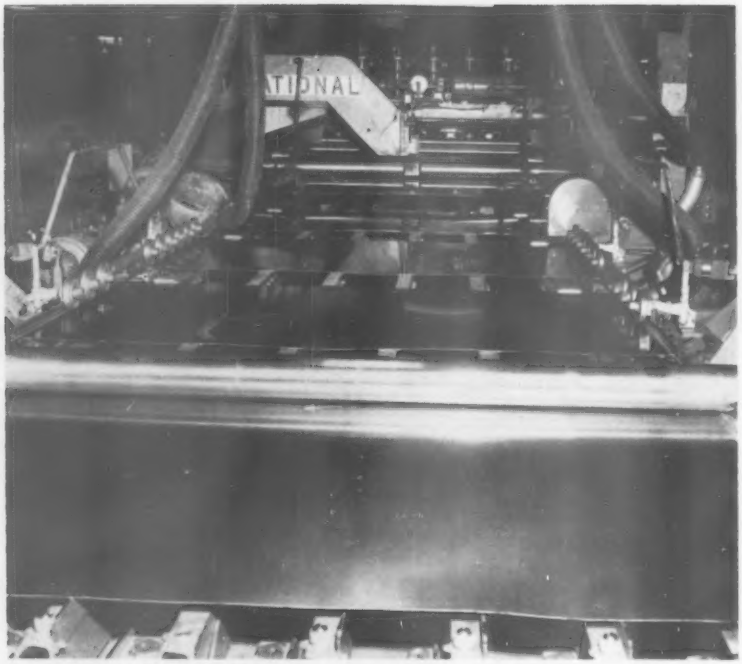
Production: Your production requirements must be high enough and steady enough to amortize the high cost of the equipment. Depending on your product, it can be as low as 100 an hour or as high as 1000.

Cost: Automated lines can cost as much as $1,000,000. The big thing is not to buy on price alone. You're usually buying the ability and reliability of your supplier. Just make sure the line designed for you is the simplest one that will do the job.

Reliability: Automated lines are designed to be reliable. And, they're not as complicated as they seem. Usually, they're made up of standard welding and metalworking machines tied together by a system of transfer mechanisms. You'll get step-by-step operating instructions and personal attention from sales engineers to help you maintain this reliability.

Maintenance: Step-by-step check lists and person-

this seam welding line turns out 1000 steel containers every hour



HIGH-LIFT VACUUM FEEDER (background) lifts sheets to magnetic rolls from which they are fed into slitter. Abrasive wheels (center) clean edges. Transfer station (foreground) pushes sheet to left into drum-forming rolls.

al help from sales engineers will help you set up an effective program of protective maintenance.

Two examples follow. They include a line which turns out 300 home washing machine cabinets an hour and one which turns out from 600 to 1000 steel drums an hour.

300 CABINETS AN HOUR

The home washing machine cabinets are made on a Taylor-Winfield automatic line which destacks sheets blanks, punches, flanges, U-bends, embosses and spot welds additional items: corner gussets, top braces, and struts—all mechanically fed into position.

Material is fed into the line by an electro-magnet destacker, which lifts and turns the sheet. The destacker has a combination magnetic and air-jet sheet separator to lift up one edge to separate it from the balance of the stack.

The next station is essentially an idle station. But, it does have centering and sensing devices to make sure only one sheet is being fed into a 300-ton punching and notching machine. This machine trims both ends, notches the four radius bending areas, and pierces holes and slots. Cut scrap automatically falls to the scrap conveyors.

After two more idle stations, the sheet moves to another 300-ton punching and notching machine where it is flanged all around.

From the next idle station, the material moves to a special four-post tangent bender for the wing-forming operation. The upper ram tooling is mounted to the crown member of the machine and the lower clamp and rocker dies to the moving member. This design permits the cabinet-wrapper blank to go into the machine and the U-shape come out in a straight-through operation.

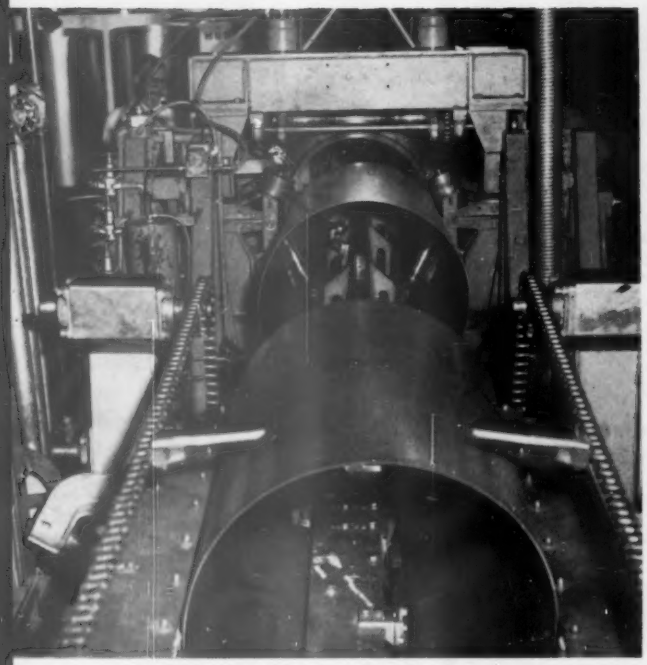
The next station, after an idle position, is a special hydraulic machine. This forms the top in-bent flanges, corner embossments, and the back flange bracket hose support.

Passing through another idle station, the cabinet is lowered from the transfer level, rotated 90°, and again raised to the transfer level.

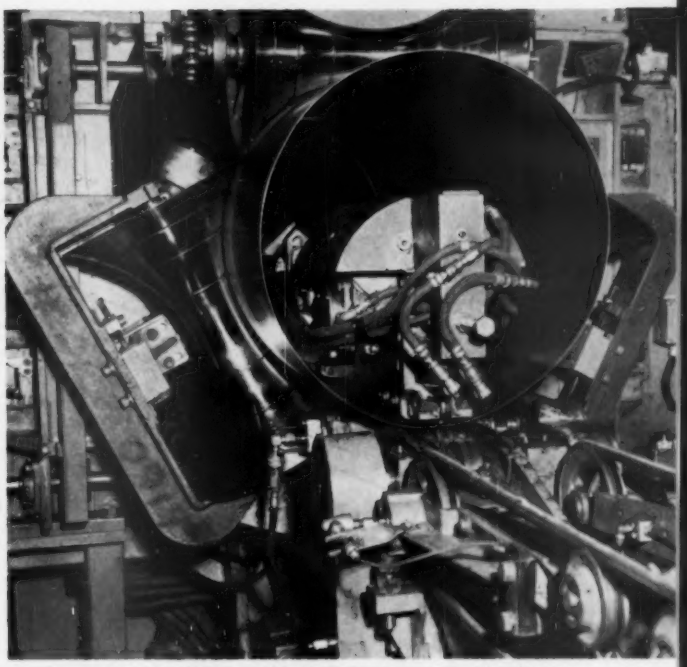
After another idle station the cabinet is fed into the top brace welder. This machine assembles and spot welds the top brace to the cabinet. An air-operated escapement-type magazine automatically feeds and loads the top braces.

Again through an idle station, the cabinet continues to a gusset welder. The four corner brackets, or gussets, are arranged in another air-operated escapement-type magazine. They are automatically loaded onto the gusset carry-in device. This mechanism receives the brackets on a horizontal plane and raises them through 90° to place them in the welding position. Each corner, has a cluster of six welding guns. When this welding is completed, the cabinet moves through an idle station into the rear flange-piercing machine. Here the cabinet shell is elevated from the transfer line into operating position. Ten holes are pierced in the rear flange and the cabinet returned to the transfer elevation.

Another idle station follows. Then the cabinet goes to a special strut welder with magazine-feed and air-escapement of the struts. It is arranged to weld both



FROM FORMING ROLLS (left), drum shells move to welder where they are guided through by hour-glass rolls (right).



Swaging unit inside the drum blends the inside contour of weld seams as the drums leave the welding station.

struts at the same time. An inner welding mandrel is arranged to expand after it enters the cabinet shell from the side. This mandrel, which moves horizontally, carries the struts into the welding position. An elevator lowers the cabinet onto the mandrel which is carrying the struts.

Completed cabinet assembly is discharged from the transfer conveyor.

600 TO 1000 DRUMS AN HOUR

The steel container industry's first fully automatic assembly equipment handles sheet, trims and cleans edges, forms, and welds at Inland Steel Container Co., Chicago.

The new line produces 600 units an hour on drums from 30- to 65-gallon capacity and up to 1000 units an hour of smaller drums. The line has quick change-over provisions that let the equipment be set up for any of three drum diameters in a fraction of the time formerly required.

The new, fully automatic welding assembly was designed by National Electric Welding Machine Company, Bay City, Michigan, in cooperation with Inland Steel Container engineers. They say the unit can weld hot or cold rolled steel sheets from 14- to 28-gauge. Sheet stock from 44- 72-inches in length can be handled. Additional tooling can accommodate 79-inch sheets. Sheet widths range from 15- 42-inches.

Using abrasive wheels to clean the side seam before welding has improved efficiency and reduced edge cleaning costs appreciably, the engineers said. An automatic adjustment system compensates for any wheel wear.

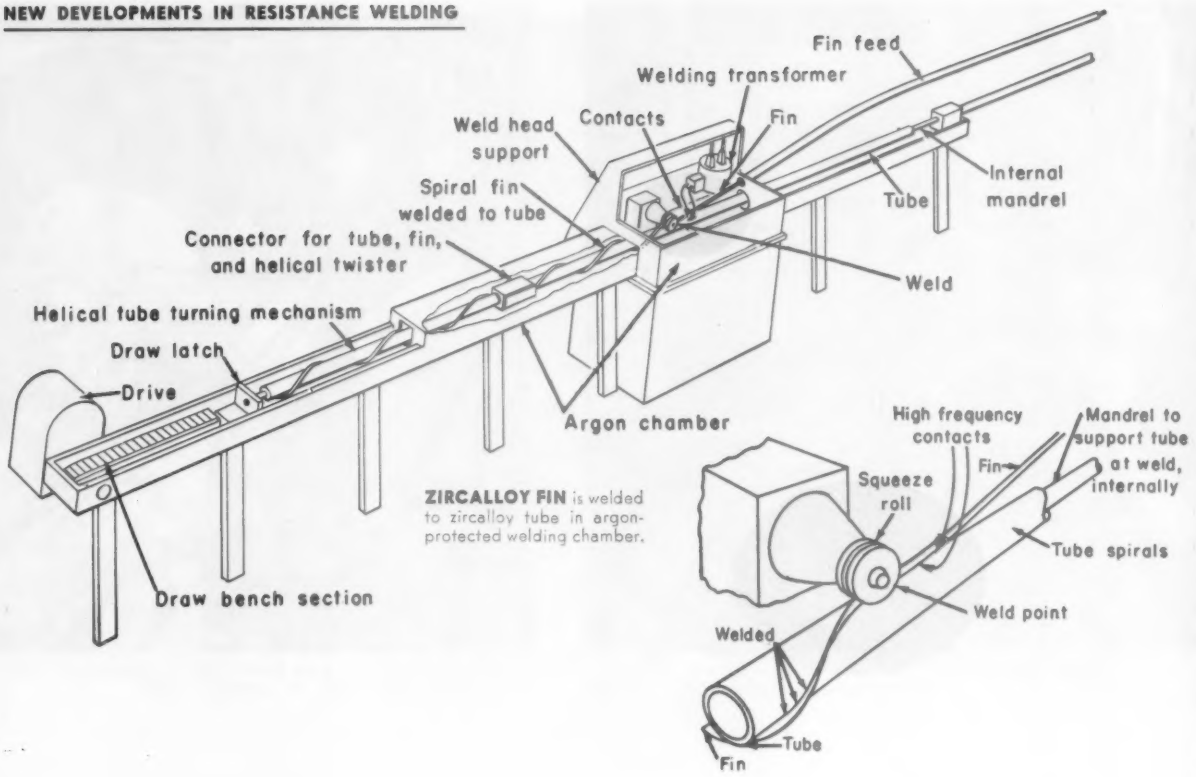
NEW PRECISION IN SIZE CONTROL

Highlift vacuum feeders feed in the steel sheets. The sheets are automatically squared and slip to keep sheet size to within 0.005-inch. Edges are cleaned and prepared for welding. The sheet is transferred to the forming rolls and then to the welding area. After welding, the weld seam is mashed to get a smooth interior finish that permits uniform lining. As the steel drum shells move along the conveying system, they are upended onto a live roll conveyor and transferred to the balance of the drum fabricating equipment.

A floor-mounted swager unit is coupled to the lower front of the welder. This unit includes an upper idler-type roller and a lower air pressurized driven contoured roll assembly to roll the inside side seam smooth. Metal displaced by swaging is contoured on the outside of the drum. The lower roll is of split type design with a threaded type adjustment for easy widening of the groove to accommodate various gauges of metal.

Controls for the new equipment include phase-shift heat controls, two tube contactors, current regulator, and an auxiliary heat potentiometer with a half-cycle firing device to stop the welder if an ignition tube fails to fire.

A feature of the equipment's control unit is a special monitoring device consisting of an oscilloscope and a selector switch. This pinpoints trouble spots in any of ten electrical circuits in the weld current contactor. An upslope device controls the magnitude of the current on the leading edge of each drum. A special indicating device monitors the welding current with over and under indicated limits. • •



High Frequency Seam Welding

IN BRIEF: High frequency techniques are said to increase speed, quality, and versatility of seamwelding operations.

RESISTANCE WELDING produces localized heat many times faster than any other fusion welding method. This high heating rate permits it to be used in place of other continuous welding processes in which the rate at which heat can be applied restricts welding to slow or only moderately fast production speeds.

CONTINUOUS SEAM WELDING

Now, a new high frequency technique is said to bring to continuous seam welding the same advantages which spot and impulse welding have provided for joining metals at specific points. And, it makes quality welds at speeds which cannot be obtained with other arc methods. The new process also improves the thermal conductivity of metal fabrications currently made by soldering, sweating, brazing or pressing joints. It can be used to weld fins, ribs or other continuous projections, odd forms and shapes to, and with, tubing and flat metals at high speeds.

The *Thermatool* techniques developed by New Rochelle Tool Corporation are now being used in over 50 tube mills. The tubing is made of 100-percent-conductivity copper, stainless and galvanized steel, hot and cold rolled steel, and rarer metals like zirconium and titanium. Even dissimilar metal combinations—copper to steel, high speed steel to carbon steel—are welded.

The equipment is versatile. The same welding head continuously welds various metals in thickness from 0.004 to ⅜ inches at speeds up to 1,000 fpm.

Using high frequency electrical energy for seam welding of tubes and strip metal is a new adaptation of an old idea: Current flows across a joint, heats the metal to the melting point, and joins the surfaces. In this newer technique, the current reverses at a very much higher rate: 450,000 cps compared to line frequencies of 60 cycles. This current does not follow the direct, low-resistance path between the two contacts. Rather, it follows a very long, low inductance path.

ONE BIG DIFFERENCE

In the new method the edges of the metal are positioned opposite each other as the strip travels through the forming mill—in the case of tubing, any standard forming mill. But, there is one big difference between low frequency resistance weld-

WELDER has output transformer in upper housing. Control panel and welding chamber are below. Chamber is used only with active metals that must be shielded during welding.

Is Versatile

ing and this newer method. The open seam is kept in an elongated Vee as it moves to the welding head. The high frequency current enters the metal through two sliding contacts. These ride on either side of the open seam about one or two inches from the root of the Vee. Each side of the Vee is a return conductor for the other because the tendency of current flowing in the low inductance path is to flow on the two surfaces of the material facing each other. These are the surfaces being welded. The narcissism of high frequency current causes it to hug the opposite edges of the metal. This skin effect produces local high intensity heating so the edges of the Vee reach welding temperature.

APPLY PRESSURE AT ROOT OF VEE

By applying pressure at the root of the Vee you get a forged weld-lap, mashed lap, or butt-edge—as desired. You can weld tubing or strips of ferrous or nonferrous metal at very high speeds. You can make strip-to-tube welds and innumerable odd combinations.

WELD ZIRCALLOY TUBING

An interesting application of this process is welding a spiral zircalloy fin to a zircalloy tube already welded by this same method. The tube is rotated so the fin can be spirally wound and welded to it. Finned tubing welded by this method has been approved for atomic reactors.

FEED TUBING INTO DRAW BENCH

The tube is fed into a draw bench over a mandrel which supports the tube. Distortion is prevented because the upper squeeze roll exerts the welding pressure. The strip of fin metal to be welded to the tube is introduced through a fin feed. The tube and fin are brought together as an elongated Vee in an argon chamber. One sliding contact rides on the tube and the other on the fin. The contacts carry the high frequency current that heats the metal to welding temperature. A protective atmosphere—usually argon—is necessary in welding the rarer metals. The ends of the tube and fin lock at the connector to a specially designed cam bar that twists the tube as it pulls it through the draw bench.

VARIETY OF USES

The manufacturers say this new process can weld the following on a continuous basis:

- Flat strip, channel, or inverted channel to tubing.
- Corners of square or rectangular tubing.
- Structural shapes such as I-beams and even double I-beams that cannot be extruded or drawn.
- Odd T-sections, either straight or at an angle.
- Longitudinal fins or ribs on tubing or strip.
- Two tubes of different diameters to provide a heating tube that will insure continuous flow of viscous liquids.

With tubing and strip metal of finite lengths, the process can weld:

- Spiral fin on tubing.
- Lip of edges to seal drum heads, etc.
- Tapered tubes, even heavy gauge metal such as that used in lamp posts.
- Perforated metal strip.
- Tubes joined together by a spacer.

SUMMARY

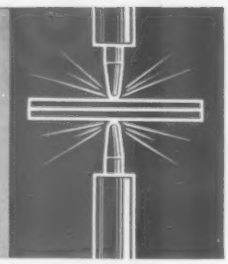
According to the manufacturer, the new process is fast, dependable, versatile, takes little space, needs no flux and filler rod, reduces scarf, and makes more feet of weld per man hour. • •

P R MALLORY & CO Inc

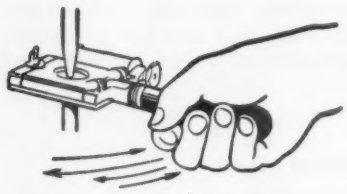
MALLORY MEMOS

NEWS AND TIPS ON RESISTANCE WELDING

Mallory Metallurgical Company, Indianapolis 6, Indiana

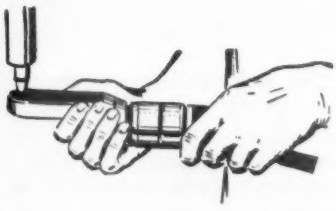


WELDING HINTS

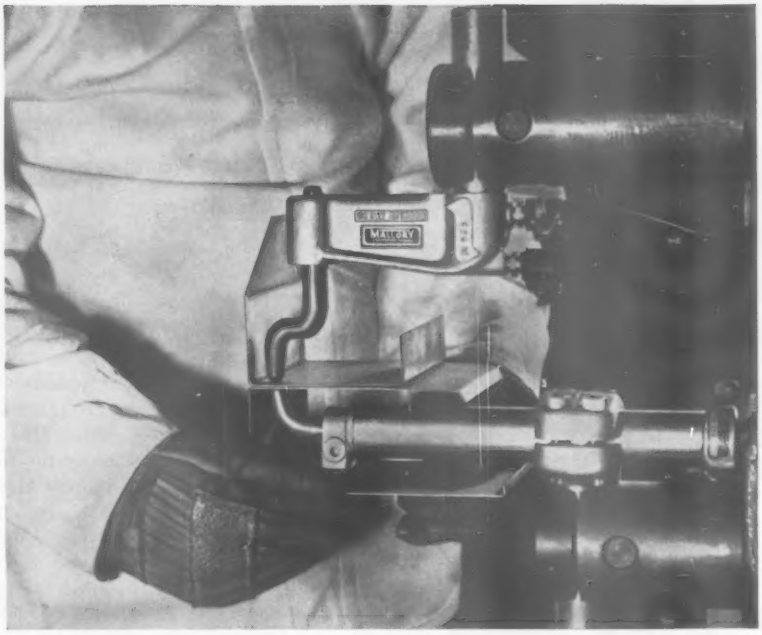


Dressing radius faced electrodes on the machine saves time, keeps electrode face contours correct. The "Maintain-A-Contour" Electrode Dresser provides convenient, inexpensive manual dressing for tips of any radius, with quick, easy change-over from one radius to another.

Dressing dome or pointed electrodes also can be handled "on-the-job". The Mallory Electrode Dresser quickly re-machines both upper and lower electrodes to the correct profile—provided both are identical—without removal from holders.



For more frequent dressing, a power-driven dresser can return sizable dividends through reduced down time. The Mallory Pneumatic Electrode Dresser speeds accurate dressing of electrodes to flat, radius, dome or truncated contours. Requiring only ¾" clearance, it can dress most electrodes on the machine.



"Special" weld set-ups are easy...*with*

STANDARD MALLORY COMPONENTS

Take a problem like welding inside a channel. It looks "special," but it's a cinch with *standard* Mallory parts. A 500 Series ejector type offset holder with a double bend electrode is mounted on the upper arm. A 100 Series straight holder with standard "T" connection, standard adaptor and single bend electrode is mounted on the lower arm.

No matter what kind of a welding job you're tackling . . . flat pieces, inside joints, tight corners, tricky configurations . . . you can find *standard* Mallory parts to make the set-up, quickly and economically.

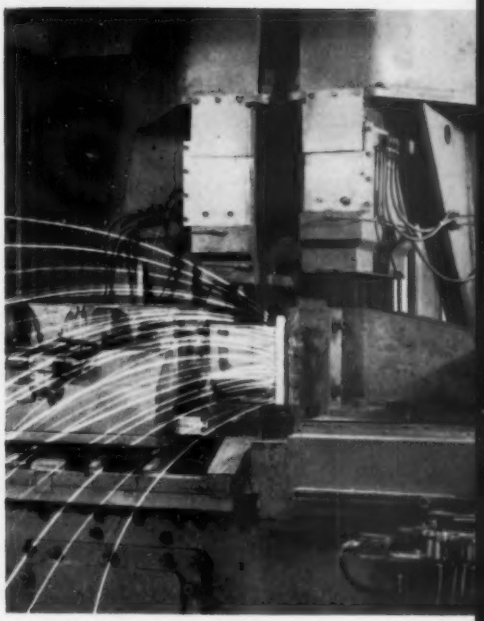
The more than 200 standard Mallory electrodes include straight, single bend, double bend and irregular styles in a variety of nose shapes and materials. The Mallory selection of holders covers straight, universal, heavy duty, paddle and low inertia models. Add them together and you've got literally thousands of combinations to fit practically any welding problem.

You'll get longer service and more consistent welds from Mallory single bend and double bend electrodes with the bent-in-place cooling tube,* which cools right to the electrode tip. More efficient cooling at no extra cost.

*U. S. Patent 2,489,993

MALLORY RESISTANCE WELDING PRODUCTS ARE AVAILABLE FROM AUTHORIZED DISTRIBUTORS LOCATED IN ALL PRINCIPAL CITIES

For More Information Circle No. 56 on Reader Service Card.



750 KVA flash butt welder makes composite die sections for the automotive and home appliance industries.

Special Flash Butt Welder Joins Alloy Tool Steel To Mild Steel

IN BRIEF: A composite die section costs 25 percent less than a similar one machined out of solid alloy steel blocks.

A SPECIAL flash butt welder is helping the automotive and home appliance industries get low cost stamping dies. Allegheny Ludlum Steel Corp. operates the giant, new machine at its Forging & Casting Division near Detroit. The mammoth welder handles shapes up to 15 inches high and 18 inches long, welds a total of 150 square inches. It replaced an older machine that would weld only 60 square inches.

WHAT IT DOES

The machine joins expensive tool steel alloys to cheaper mild steel to form composite die sections. The expensive alloy goes only on the working or cutting edge of the die. The tool steel is usually cut or shaped to the desired design before welding. This calls for less tool steel and less work to machine the die.

These composite die sections can be made in an almost unlimited range of sizes and shapes. Special shapes with cutting edges of water-hardening, oil-hardening or shock-resisting tool steel can be made easily.

Fred C. Shields is sales manager at Allegheny Ludlum's Forging & Casting plant at Ferndale, Michigan. He says customers say that composite dies cost 25 percent less than dies machined out of solid alloy steel blocks.

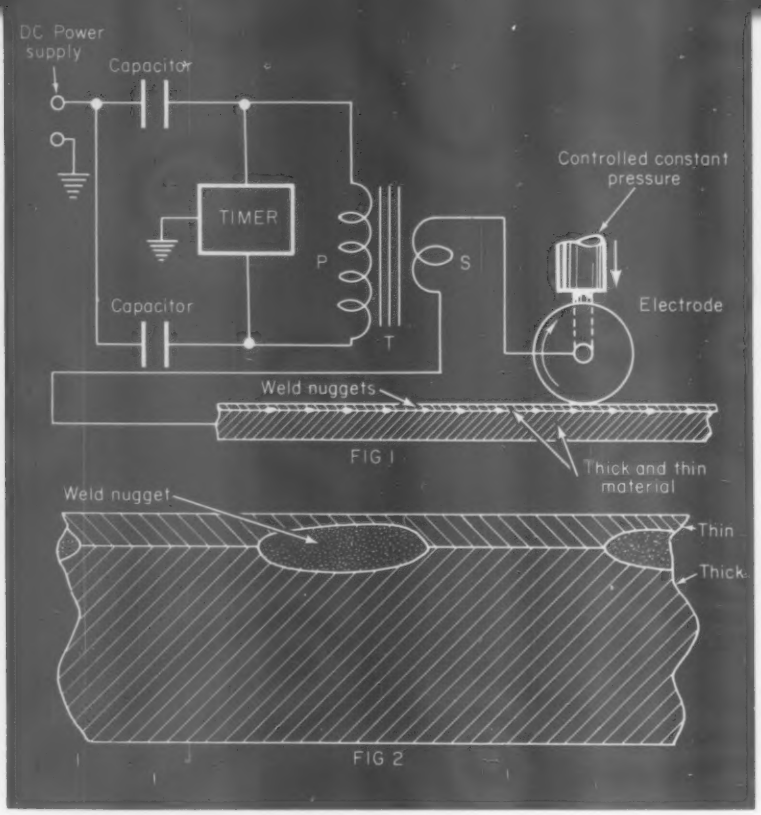
HOW IT WORKS

The welder, with extreme heat and intense pressure, butt welds the two chemically different metals.

For years steelmen have felt that the better the weld the closer the physical properties of the welded pieces become. Mr. Shields says: "The physical properties of the weld approach the physical properties of the tool steel itself." There is little trace of the welded seam after pieces cool.

USE HEAT AND HIGH PRESSURE

A good weld, Mr. Shields says, needs intense heat and high pressure. The welder has a heat power supply of 750 KVA and uses up to 1,600 psi of pressure. • •



Ryan Aeronautical's new development makes possible . . .

Spot Welding Thin-To-Thick

IN BRIEF: A new development gives the accurate heat control, accurate welding time and constant electrode pressure needed to make satisfactory spot welds when joining thin to thick materials.

FAILURE IS WHAT you could reasonably expect when you resistance weld thin sections to thick. But not any more. Ryan Aeronautical Co., at San Diego claim that they can successfully weld thin to thick material with newly invented welding apparatus.

DEVELOPMENT OBJECTIVE

The big aim of Ryan's invention is to improve resistance welding for two pieces of material whose thicknesses vary 4 to 1. This needed:

First: Accurate control of welding heat, a method for applying very high, unidirectional welding current for a short period. This prevents burning and reduces heat losses from conduction and radiation.

Second: A proper weld nugget, electrode pressure, and accurate welding time. These and locating the spot properly at the interface of the material pieces play an important part in getting a good bond.

Third: A fast follow up through the use of short welding time. Fast follow up, welding electrode pressure, and sufficient cooling time on the weld area prevents cavitation of the nugget during shrinkage.

Fourth: A welding method that is simple, safe, and convenient, one that produces a uniform, accurate, and securely bonded structure.

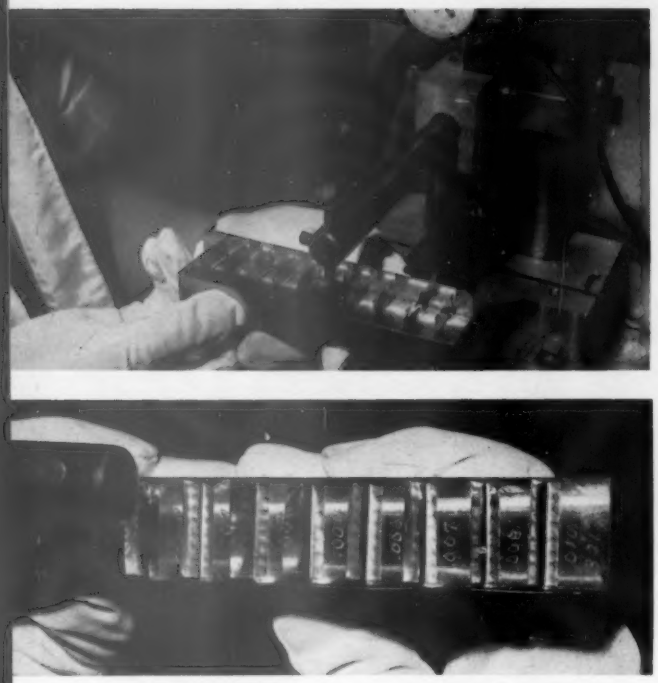
HOW IT IS DONE

The apparatus is simple. It consists of a pair of large capacitors that are charged from a d. c. voltage power source. (See Figure 1.) The capacitors are connected to opposite ends of the transformer primary winding. A timer, connected to both capacitors, discharges either capacitor to ground through the primary winding.

Various types of timers can be used, the patent doesn't cover them. The secondary winding of the transformer is connected at one end to a welding table or connected to the thick material welded to the thin material. (See Figure 2.) Any welding electrode, wheel type with constant pressure, suits the purpose of holding materials together at the point of weld. The wheel electrode rolling along the surface of the thin material makes a row of spaced spot welds. Other pressure contact electrodes may be used to give accurately controlled pressures.

The timer must be able to discharge the capacitors in from a fraction of a millisecond, to a few milliseconds. It depends on the material and welding.

A unidirectional pulse of stored current released from a capacitor through the primary makes a pulse of welding current flow in the secondary. The trans-



NEW EQUIPMENT spot welds Type 321 stainless (.001 to .010-inches thick) to a Type 321 stainless bar.

former is built to give an extremely large current flow at low voltage. A current of 40,000 amperes at 2 volts has been used with satisfactory results.

WELDING THEORY

Ryan Engineers say their method of welding is suited to welding sheets a few thousandths of an inch thick to much thicker plates. In resistance welding the weld nugget often forms in the thick material, instead of at the interface, and there is no bond.

In any welding, the welding heat can be expressed by the formula: $H = I^2 RTK$ where H is the heat, I is the amperage, R is the total resistance, T is the time of current flow and K is a constant. The heat is proportional to the resistance and time. Similarly the welding current is inversely proportional to the square root of the time.

INTERFACE RESISTANCE

If welding time is extremely short, then the current required is abnormally high. With short current flow time, heat losses are reduced by conduction and radiation. With a control of this type you get a more accurate control. With the high amperage and short time, resistance, R, controls whether you get a weld at the interface. The resistance, R, is the sum of two components, surface, or contact, resistance. Surface resistance is localized at the interface of the materials being welded, and the resistance of the material is negligible. The thin material has a slightly greater resistance. Surface resistance at the interface is the key. Electrode pressure is also important. Interface resistance can be nearly constant, because the surface finish of very thin sheet is smooth and constant.

When you apply welding current, the greatest heat built up is at the interface of the material, which is the area of greatest resistance. Here the weld nugget forms. A good nugget has its maximum dimension or major axis about four times the thickness of the thin material. The bead should penetrate about ½ of the thickness of the thin material. (See Figure 2.) It has been found that welds of these accepted standards can be produced constantly by the new method.

WELD SHRINKAGE

Another advantage of the short time of current flow: you can follow up fast. In some welding processes, the electrode is removed from the weld area before the weld nugget cools. When this happens, shrinkage occurs in the weld nugget. Shrinkage occurs from the outside toward the center, this causes cavitation between portions of the nugget and the surrounding material. This reduces the quality of bond. By using a weld time in the new method of less than a millisecond to a few milliseconds, you can maintain welding electrode pressure on the weld area for a sufficient time to permit the weld nugget to cool. No cavitation occurs because the initial rate of cooling is very rapid. Since the total quantity of heat involved is small and concentrated, radiation and conduction losses are negligible. The weld nugget solidifies almost immediately, before the electrode pressure is removed. This fast follow-up and control gives a satisfactory forging action.

WELDING WHEEL TRAVEL SPEED

When using a wheel type electrode that advances as much as 15 inches per minute and makes 10 welds per inch, for example, it has been found that the electrode pressure is maintained long enough to avoid cavitation. In the type of welding using longer weld periods, excessive heat is generated in the weld area. Here the weld cools more slowly and it is difficult to maintain complete follow-up pressure with fast repetitive welding. With the new process, there is no excess heat; this makes it practical to gauge welding wheel travel speed. Sufficient pressures can be obtained at all times. You get the forging action you need on the weld nuggets during the initial cooling. This prevents cavitation. With the very thin materials used, the weld nugget size is very small. Surface distortion of the material due to follow-up pressure is negligible. With the new process Ryan used welding times ranging from as short as three hundred microseconds to a maximum of six milliseconds, and welding currents up to 40,000 amperes.

Figure 1 shows the two capacitors discharged alternately. A single capacitor, or multiple capacitors may be used. The timer is set up to discharge the capacitors singly. The use of several capacitors allows each one sufficient time to become fully charged and enables reproduction of fast repetitive spot welds to be made at all times. ••

by M. H. BESTER, Supervisor,
Metallurgical Materials Laboratory, Autonetics Division of North American Aviation, Inc., Downey, California

FIGURE 1: Preliminary work was done on single waffle-core with trihedral pyramid configuration. Spot welding .002 inch core to .006 inch facing sheet is done with heavy gage, contoured. sheet-copper lower electrode.

Expendable Electrodes Are Used In Spot Welding Waffle-Type Honeycomb Panels

IN BRIEF: Spot welding new waffle-type honeycomb panels with expendable electrodes eliminates certain disadvantages of brazed honeycomb panels.

SANDWICH STRUCTURES for supersonic aircraft and missiles continue to challenge airframe designers.

DESIGN CONSIDERATIONS

The bulk of current requirements is met by the brazed honeycomb sandwich. It's close to an ideal sandwich for many jobs. But its production cost is high, from $300 to $600 per square foot. And, because it is brazed, there's a limit to how hot you can get it.

These disadvantages have encouraged attempts to make resistance welded sandwiches. One of these is a waffle-core sandwich structure fabricated by the expendable electrode method.

The first facing sheet of a single waffle-core sandwich can be resistance welded to the core by conventional techniques rapidly and with no difficulty. A problem, however, is apparent when the second, or close out, facing sheet is joined to the core by conventional resistance welding. The waffle core is unable to carry the electrode force needed to produce reliable spot welds.

Increasing the gage of the core material to carry the necessary electrode force defeats the whole idea. The core is supposed to separate the facing sheets with the least weight, yet support the facings so they can support the greatest stress.

EARLY EFFORTS

The first attempts were: projection welding, inert arc gun spot welding, and furnishing temporary mechanical support.

Projection welding permitted using reduced electrode force. However, the quality of the first welds and their reliability did not encourage further investigation.

The results of inert arc gun welding were better. However, the process generated so much heat in closing-out the sandwich that it caused local distortion and overall warpage. The sandwich simply wasn't flat enough.

It was apparent that a filler material would prevent the collapse of the core under the electrode forces used in conventional spot welding. We tried plastics, ceramics, and low melting point alloys. Most were too difficult to remove, but we learned the best temporary filler materials acted as a mechanical support and as an electrical conductor.

The low melting point of bismuth base alloys ruled them out. Then we found that we could make

FIGURE 2: Close-out facing is then spot welded in place using clusters of precision cast beryllium-copper electrodes shown in Figure 1.

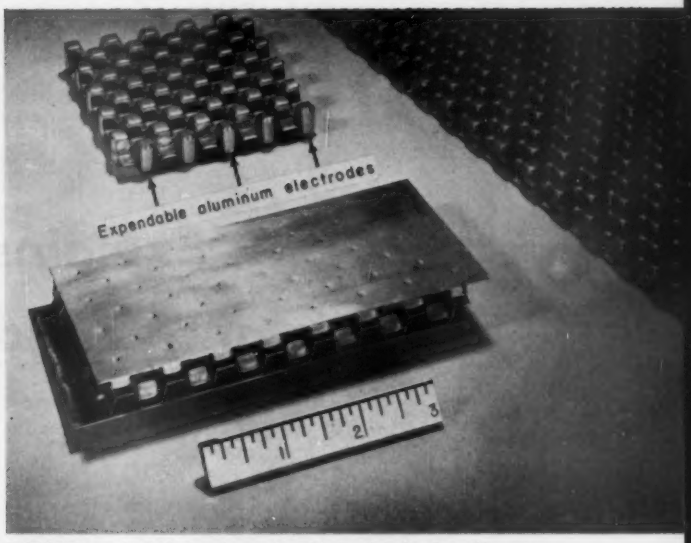


FIGURE 3: Final design is made with back-to-back waffle core configuration using hard drawn electrical conductivity grade expendable aluminum electrodes.

low resistance expendable electrodes from either copper alloy or high conductivity aluminum. These provided both mechanical support and a current path.

ON THE WAY TO SUCCESS

We did preliminary work with a single waffle-core of 3-sided pyramids. Clusters of precision cast Be-Cu (beryllium-copper) expendable electrodes were used. The conductivity of these is half that of annealed copper.

The first step in fabricating a double contoured part is joining the stretch-formed 0.006 inch thick 17-7PH stainless steel facing sheet (Figure 1) to a waffle core of the same material, 0.002 inch thick and stretch formed to contour. Then we spot welded these components with a heavy gage, contoured sheet-copper, lower electrode. Next we added the second or close-out facing (Figure 2). The expendable electrodes used here were removed by dissolving them in a nitric acid solution.

Two disadvantages were apparent. First, the contour deviated from the original contour. Secondly, Be-Cu precision cast expendable electrodes are expensive.

FINAL PRODUCT

To overcome these disadvantages we adopted the contour shown in Figure 3 and used hard-drawn electrical conductivity grade aluminum for the expendable electrodes. This new design uses a back-to-back waffle core configuration. The expendable electrodes have to be in each core cell prior to assembling the waffle "back-to-back" by resistance welding in the neutral plane. Conventional welding techniques were employed in this step. We attached the top and bottom facing sheets by simultaneous series welding at each expendable electrode. Each facing sheet was heated and forged identically. Adequate flatness resulted.

Expendable electrodes for the first "back-to-back" configuration were manufactured by screw machine. However, these electrodes should be produced in die-cast clusters to cut costs. Aluminum expendable electrodes are considerably cheaper. And they may be dissolved by a caustic solution.

The core material was AM 350 alloy, deep drawn from 0.010 inch gage sheet. The facing sheets were of 0.016 inch stretched 17-7PH alloy. The thickness of the sandwich was ½ inch.

Although no contoured parts have been produced employing the "back-to-back" core configuration, we believe that separate stretch forming of skins and core assembly before fabrication is entirely feasible. The trapped expendable electrodes will serve to maintain constant thickness when stretch-forming the core assembly. • •

turn to page 70 for an explanation of hardness testing of resistance welding electrodes by an officer of the RWAA.

RWAA Explains Hardness Testing Of Resistance Welding Electrodes

by **H. A. MULLEN,** *vice president, Resistance Welding Alloy Association*

"WE NEED HARDER material for longer-lasting resistance electrodes," everyone says. But, hardness isn't everything. Inadequate cooling, wrong material, incorrect settings, wrong electrode shape and maintenance, and condition of work surfaces also make electrodes deteriorate rapidly.

In the absence of better tests, hardness has become an easy—if not correct—index to electrode life. Hardness testing, valuable for determining alloy classification and conformity to physical specifications, has limitations and fallibility. You must use it correctly and judiciously.

Rockwell (Normal and Superficial) and Brinell are the easiest and most popular ways to measure hardness.

ROCKWELL

Rockwell measures hardness by the depth of penetration of a small ball (1/16 inch diameter for B scale) or diamond point (C scale). Use it on small pieces of wrought material with machined or ground surfaces. On smooth surfaces of castings Rockwell may be accurate. It also may be unpredictable because of variations in grain structure and size. Use Rockwell B for RWAA Class I, II, III, and V alloys. Use Rockwell C scale on Class IV alloys whose high hardness puts them out of the effective range of the B scale.

BRINELL

Brinell measures hardness by the diameter of the impression made by a larger 10 mm ball. It covers a larger area, averaging out irregularities. It is more suitable for rough forgings and castings and even on smooth castings.

The Brinell machine is larger and stronger. It can be used on large, heavy pieces which would be difficult or impossible to handle on Rockwell.

Use the common 3000 kg. load for RWAA Class II, IV, and V alloys. This load makes too large and too irregular an impression on Class I and II alloys. On them use a 500 kg. load.

PREPARATIONS ARE IMPORTANT

Preparation is important. Calibrate your instruments regularly against standards. Keep them adjusted and repaired.

In Rockwell testing, make sure surfaces are smooth and opposite faces are parallel. For Rockwell B, the surface finish should be at least as fine as 320 grit abrasive paper or about 63 microinch finish.

In Brinell testing, the surface finish should be smooth enough to obtain well defined impressions whose diameters can be measured precisely. This usually takes about a 125 microinch finish.

For Brinell testing rough surfaces, grind them deep enough (1/32 inch) to get under the soft copper skin from which alloying constituents have been oxidized by hot forging or heat treating in atmospheres not controlled to prevent this. Prepare a surface section large enough (about 1¼ inches diameter) to

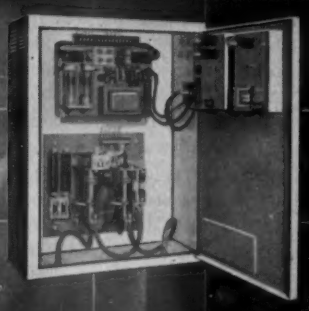
continued on page 72

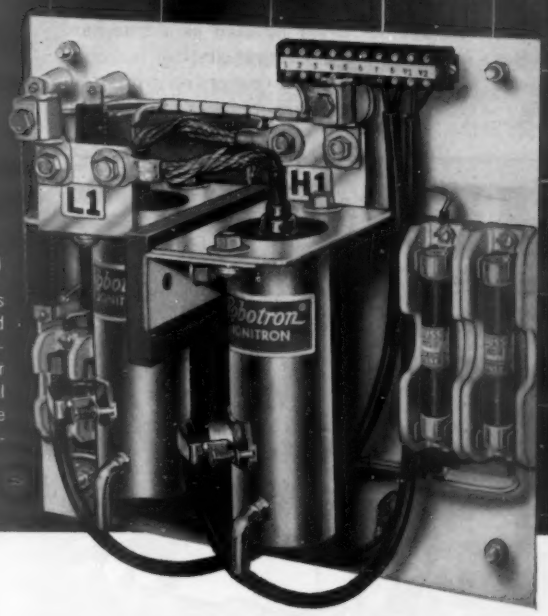
REFERENCE GUIDE FOR HARDNESS TESTING

- **ASTM E-10-58T**
  Method of Test for Brinell Hardness of Metallic Materials
- **ASTM E-18-59T**
  Method of Test for Rockwell and Rockwell Superficial Hardness of Metallic Materials
- **ASTM E-92-57**
  Method of Test for Diamond Pyramid Hardness of Metallic Materials
- **ASTM E-110-57**
  Method of Test for Indentation Hardness of Metallic Materials Using Portable Hardness Testers
- **ASTM E-140-58**
  Hardness Conversion Tables For Metals
- **American Society for Metals**
  Metals Handbook, 1948
  Hardness Tests, pages 93-105

Circle No. 74 on Reader Service Card.

Robotron Announces
a Significant Advance in the Art
of Resistance Welding...





NEW GENERAL ELECTRIC COAXIAL IGNITRON TUBES

Robotron Spike Power Control Units are insulated for high voltages and are equipped with new coaxial ignitron tubes developed by the Power Tube Department of the General Electric Company. These tubes make possible high current, short duration pulses without misfiring.

Controlled Spike Power!

For Practical Pulse Power Resistance Welding

- Makes welding practical for many new applications . . . including the joining of dissimilar metals.
- Spike Power reduced shunting effects . . . minimizes need to prepare or clean surfaces.
- Less surface indentation . . . lower finishing costs.
- More uniform weld nuggets . . . higher quality, superior welds.
- Smaller welding transformers.

WRITE FOR SPECIAL BULLETIN ON THIS NEW KIND OF RESISTANCE WELDING DEVELOPED BY THE ROBOTRON CORPORATION . . .

or ask your local Resistance Welding Equipment Representative for more information now.

THE FINEST IN INDUSTRIAL ELECTRONICS

Robotron® CORPORATION

21306 WEST EIGHT MILE ROAD DETROIT 19, MICH

HARDNESS TESTING

continued from page 70

accommodate the base of the Brinell microscope and ensure an accurate reading.

LIMITATIONS

Normal Rockwell readings on curved surfaces (round rod) are inaccurate. They are only approximate even if you apply correction factors. The error increases with the decreases in diameter. For example, Rockwell B correction (addition) for 1 inch diameter varies from 0.5 to 3.0 points; for ¼-inch diameter it varies from 03.5 to 12.5 points.

The best place to test a rod or bar is not the outer surface. It is the cross section half-way between the center and the outer edge. You may not be able to use this spot without destroying a usable electrode. In this case the inaccuracy of an OD reading can be increased by the unrecoverable motion incurred by taking the hardness on a hollow section caused by the water hole. Instead, take the reading on solid metal on which two small, opposing parallel flats have been ground. Even resting the round surface in a V-anvil can add to the error.

On rods under ¼ inch diameter Rockwell tests are inaccurate. It is inaccurate on the diameter. And, it is inaccurate on the cross section, because of possible distortion which occurs in taking a reading too close to the edge of any section. Flat stock under ⅛ inch is also difficult to test because the effect of the anvil through the material influences the reading. These are good areas in which to use Superficial Rockwell. It cuts down on the load and depth of penetration. But, tensile tests are better. Use them when you can.

NEW STANDARDS

The new RWAA and RWMA standards will specify tensile strength and Superficial Rockwell instead of Normal Rockwell values on resistance welding electrode materials less than ¼ inch diameter of less than ⅛ inch thick.

Published conversion tables for steel and brass are the only ones now recognized. They are not suitable for other materials except in a manner previously recommended. If you really need accurate hardness conversion tables on resistance welding alloys, make them yourself because these factors will vary with and have to be specific for each separate alloy.

Conversion from one form of hardness reading to another by the use of standard published tables should be used only to establish approximate relative values for comparison. Conversion figure should never be used as a true hardness reading. Each type of hardness testing is subject to certain errors and general conversion with specifics in mind could make existing errors cumulative. • •

MAGNIFIQUE

Model

510

ARO

ARO SPOT WELDER DIV.

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38-31 CRESCENT STREET LONG ISLAND CITY 1, NEW YORK

18,000 amps • 1350 lbs. pressure • Welds from lightest gauge up to 2x3/16" • Fully automatic • Air Operated • Water cooled

A Wide Variety of Models Available for Every Job

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SMS CORPORATION

HEADQUARTERS
FOR

RESISTANCE WELDING SUPPLIES

R. W. M. A. CLASSES OF ALLOYS
IN CASTINGS, FORGINGS AND BAR STOCK &
COPPER TUNGSTEN ALLOYS

WELDER WHEELS IN ALL ALLOYS
AND SIZES TO SUIT YOUR REQUIREMENTS

ALL TYPES OF STRAIGHT AND OFFSET HOLDERS
STANDARD ELECTRODES

AND SPECIAL TO YOUR SPECIFICATIONS

ADJUST-A-PRESSURE HOLDERS

ADJUST-A-ANGLE ADAPTERS

FOR MULTIPLE SPOT AND INDIRECT SPOT WELDING

TIP DRESSERS, REAMERS AND CONTOUR DRESSERS

WE DESIGN AND BUILD SPECIAL ELECTRODES
AND FIXTURES

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WELD WITH
Tipaloy

YOUR Resistance Welding Electrode NEEDS Are OUR Business!

Whether it be:
TIPS:
ROD or BAR:
SEAM WELDING WHEELS:
FORGINGS:
CASTINGS:
HOLDERS:
ADAPTERS:

SPECIAL WELDING DIES or FIXTURES: TIPALOY *has them.*

BUY TIPALOY and save money!

TIPALOY can supply you with:
RWMA Class #1, Tipaloy #100
RWMA Class #2, Tipaloy #130*
RWMA Class #3, Tipaloy #200
and other RWMA classes of alloys to fit your needs.

It is unwise to pay too much, but it is worse to pay too little!

Use TIPALOY and get 30% to 100% more performance for your money than you are now getting.

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Send your trial order today

*TIPALOY #130 cast and processed under our patents.

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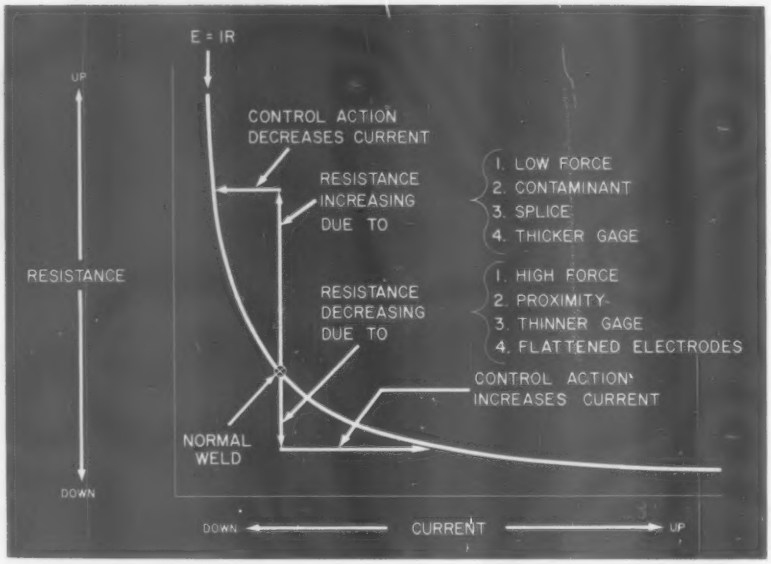
Circle No. 84 on Reader Service Card.

New Developments For Resistance Welding



KEY TO OPERATION is Ohm's Law . . . curve represents constant voltage, with current rising as resistance falls. During operation, the heat control adjusts current to maintain a constant voltage across the weld.

Feedback spot welding control makes its own ideal welding conditions

The Monautronic V-2 feedback spotwelding control introduced by Budd Company utilizes the feedback principle to produce "ideal" conditions for resistance spotwelding regardless of the actual conditions that would normally affect weld quality. The control is said to compensate *automatically* for variations in line voltage, applied force, electrode wear, variations in surface finish, fitup, thickness or hardness of material, shunting effect, amount of ferrous material in secondary circuit, severe contamination, variations in horn and electrode lengths causing reactance changes, and any other conditions that would result in substandard welds.

The V-2 Control obtains correct fusion temperature within each weld by relating the voltage across a given weld area to the ultimate temperature that will occur within the weld. The control system then measures the *actual* voltage at the weld electrodes and compares this value to a "command" voltage related to the desired temperature which has previously been "programmed" into the control —a known quantity based on previous welding experience for the particular type and thickness of metal and the weld strength desired. This command voltage instantaneously compensates for any difference between the two voltages by making automatic heat adjustments for each weld as it is being formed.

The "feedback" information on the voltage across the weld is "processed" by appropriate input circuits, similar to those used in radar and in both digital and analog computers. This feedback information makes the heat-input setting fully automatic regardless of variations of the type described above.

If conditions develop at the weld which would result in a substandard weld and which are beyond the available range of control, the Monautronic V-2 senses that it can't make a good weld under such conditions. It accordingly "locks out" automatically, halting the welding operation, so that the operator can correct the nonweldable condition, then reset the control and continue making good welds.

The control insures consistency and reliability of welds over long periods without need for testing and inspecting of sample welds. Unit features modular and shock- and vibration-resistant construction. A safety interlock protects personnel during tip dressing. Control has fully automatic sequencing, with all provisions for single-spot, roll spot or seam welding. Sequencing is 100% accurate, and exceeds NEMA standard spec 3B.

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Circle No. 71 on Reader Service Card. ⟶

COMPLETELY NEW SERIES 300

PEER

UNI-STRUT SPOT WELDER THE MOST VERSATILE WELDER EVER BUILT!

HERE'S PROOF!

Converts Quickly To Your Specific Application!

Foot—Air Rocker—Air Press—Long Throat—Short Throat

PATENTS PENDING

WHATEVER YOUR NEEDS, THE PEER UNI-STRUT WELDER is easily *converted* in the field quickly without drilling holes, welding or similar construction. *Peer Conversion Kits* accomplish this with facility and no special tools are required for such modifications. You protect your original investment.

EXCLUSIVE PEER UNI-STRUT CONSTRUCTION provides the most rigid structure ever available on a spot welder. Adjustable Throat Design enables the user to move arms in or out; lower arm may be raised or lowered.

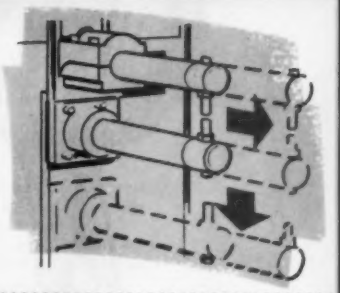
CONTINUOUS HEAT CONTROL is a standard feature which offers an infinite number of welding current adjustments. Current can be reduced far below other standard welders giving a much wider welding range.

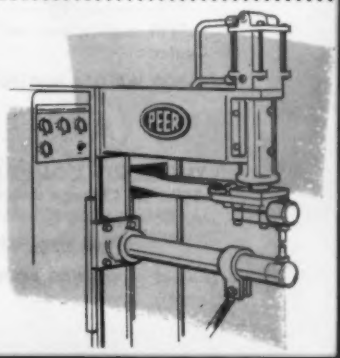
NEW TRANSFORMER—More compact, more efficient, Silicone Class *H* insulated *high-power factor*. Available for 220/440 volt standard or other voltages.

• Concealed water hose • All controls visible and accessible from front • Easily serviced—any part removed without disturbing other components • New slim-clearance ejector-type electrode holders • More welding capacity over a wider range • Storage space for spare tubes, tips, etc.

WRITE *TODAY* FOR COMPLETE INFORMATION AND SPECIFICATIONS
ON THE *ALL NEW* PEER SERIES 300 *Uni-Strut* SPOT WELDERS!

PEER, INCORPORATED • WELDING EQUIPMENT DIVISION
• 1248 MILTON • BENTON HARBOR, MICHIGAN





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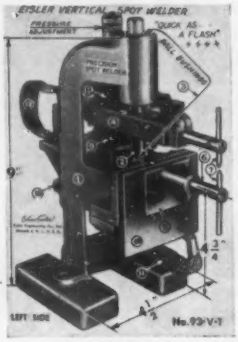
EISLER MAKES THE LARGEST VARIETY OF RESISTANCE SPOT, WIRE BUTT, FOIL, AND SPOT WELDERS, ALSO WELDING TIPS, HOLDERS AND ACCESSORIES.

WELDING TIPS

ACCESSORIES



EISLER ENGINEERING CO., INC.
735 SOUTH 13th STREET NEWARK 3, NEW JERSEY

THE NEWEST PORTABLE SPOT WELDER

Merit Might Midget

Completely new . . . and engineered for today's production demands . . . the Merit Might Midget is the perfect answer to all your welding problems.

- Trouble-free electronic timer and contactor
- Welds up to 3/16" combined thickness
- Uses standard #1 Morse taper tips
- Variable tip pressure—0 to 1000 lbs. in seconds
- Available in 2 models; Water-cooled or Air-cooled

For additional information, ask your jobber or write: The Merit Company, 2124 W. Chicago Ave., Chicago 22, Ill.

Sold through jobbers only
Contact:
SPOT WELDER DIVISION
THE MERIT COMPANY
2124 W. Chicago Avenue
Chicago 22, Illinois

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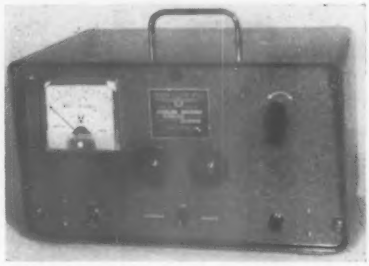

Stored Energy Welder

A 10 watt-second stored energy precision welder for thin wires and foils has been developed by Vacuum Tube Products Division of Hughes Aircraft Co. The VTW-28 delivers an adjustable range of power of 0.01 to 10 watt-seconds in less than 0.001 seconds. With automatic voltage regulation, repeatable power is attained, even with line voltage fluctuation of plus or minus 20 percent.

A variable transformer and silicon rectification eliminate the need for tubes in charging the circuit, assuring a smooth, stable output.

Circle No. 201 on Reader Service Card.

Portable Cycle Counter

A new counter that counts AC cycles of weld time to an accuracy of plus or minus ¼ cycle has been developed by Instrument Control Co. The new device will count up to 127 cycles. Small enough for one-hand operation, the Porta-Count is a binary counter that is simply held near the welder or cable. Weld time is counted as the welder fires.

An induction pick-up is used to feed a signal to the counter, so no clips, clamp-on coils or other connections are needed. The device senses the magnetic field around a welding bus, transformer lead or welding electrode.

Circle No. 202 on Reader Service Card.

Resistance Welding Alloy

Electroloy Grade Z is a new resistance welding alloy for spot welding galvanized and other coated materials. It was developed by Electroloy Company.

An alloy of zirconium and copper, the alloy has a hardness a little low-

er than the RWMA Class 2 specification, but considerably higher electrical conductivity. Its most unusual characteristic is its ability to withstand relatively high temperatures with little softening or loss of conductivity. This unique combination of properties is believed to be the reason for the alloy's low tendency toward sticking or pickup of the coating on galvanized stock.

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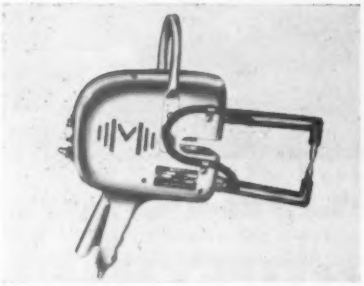

Portable Spot Welder

The Might Midget introduced by Merit Company has a trouble-free electronic timer and contactor and will weld up to 3/16-inch combined thicknesses. It has water-cooling, uses standard #1 Morse taper tips and gives tip pressures from zero to 1,000 lbs. in seconds.

The unit is designed for portable or pedestal operation.

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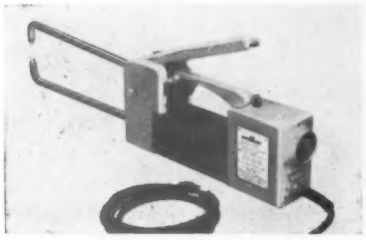


Portable Spot Welder

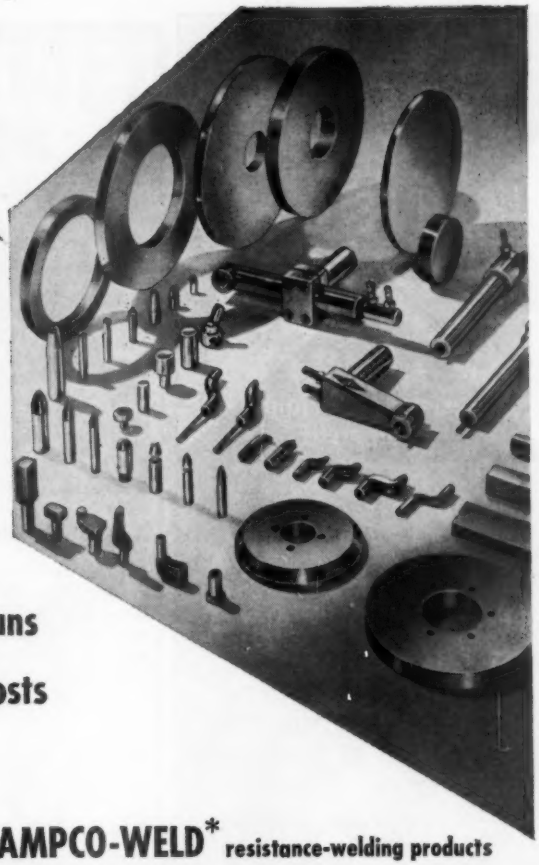
A portable spot welder introduced by Miller Electric Mfg. Co., Inc., has a built-in electronic timer. The Lectro Spot welder is said to make completely uniform and consistent welds because this timer and pre-set tip pressure function from weld to weld without variation.

A weld is made in a single motion. The operating handle is depressed and tongs grip work at proper pressure, switch is actuated and electronic weld timer starts and stop automatically. Tips last longer because current doesn't flow until pressure is established.

Unit is available in 5v or 230v single phase models.

Circle No. 204 on Reader Service Card.

You've Got What It Takes



for longer runs and lower costs

...when you use AMPCO-WELD* resistance-welding products

Every item in the complete Ampco-Weld line is manufactured under strict laboratory control to give you longer runs and lower costs.

AMPCO-WELD spot-welding tips — stay cooler — won't stick to the work . . . tough — resist mushrooming and wear . . . fewer dressings needed — they last longer, cost less.

AMPCO-WELD rod — is available from stock — either in rounds, including hex, or in square and rectangular bars. There's a size for every need — all feature Ampco toughness and high electrical conductivity.

AMPCO-WELD seam-welding wheels — many users report 150% longer life. Resist wear — even at elevated temperatures. High electrical conductivity. Get them on short notice as rough forgings, finished blanks, or fully machined.

AMPCO-WELD resistance-welding holders — to suit every job — straight, offset, and universal ejector models. Offset and universal holders have interchangeable sockets for No. 1 and No. 2 Morse tapers. You change tapers without changing holders.

All Ampco-Weld resistance-welding products meet or exceed RWMA specifications. Experienced engineering service is also available. Get what it takes to lower your resistance-welding costs — get Ampco-Weld, the best value for your resistance-welding dollar.

RW-18

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Sole producer of genuine Ampco Metal

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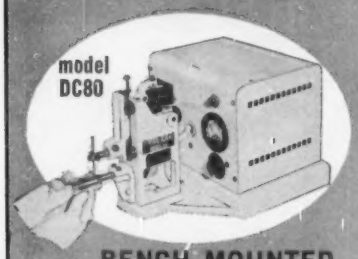
NOW produce up to 6,000 welds per hour . . . automatically . . . with one operator.

TWEEZER WELD

Precision Resistance Welding Equipment



BENCH MOUNTED STORED ENERGY WELDER

- New TW5 low friction welding head
- Stored energy panel of 80 Watt second capacity
- Discharge time of 0.0008 to 0.0012 second
- Permits welding of difficult materials, i.e.: copper, silver, tungsten, etc.
- Reliable welds without discoloration, deformation, metallurgical change

COMPACT SYNCHRONOUS WELDING TIMER
6" wide
10½" high
8½" deep
model T-3

TRANS-SYNC WELD-TIMER

- 1 KVA capacity utilizing semiconductors.
- Also ideally suited with high speed automatic machinery.
- Operates at a rate up to 1200 welds per minute . . . welds partially oxidized materials with ease.
- Welding time: ½ cycle (8 milliseconds) to 10 cycles (160 milliseconds).

FEDERAL TOOL ENGINEERING CO.
1400 Pompton Ave.
Cedar Grove, New Jersey

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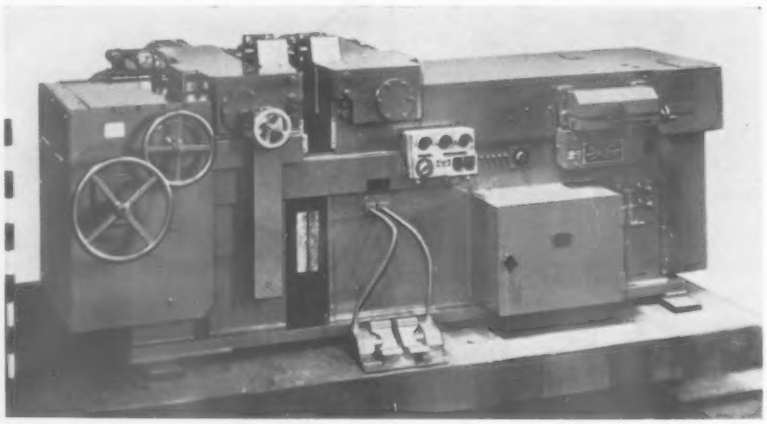
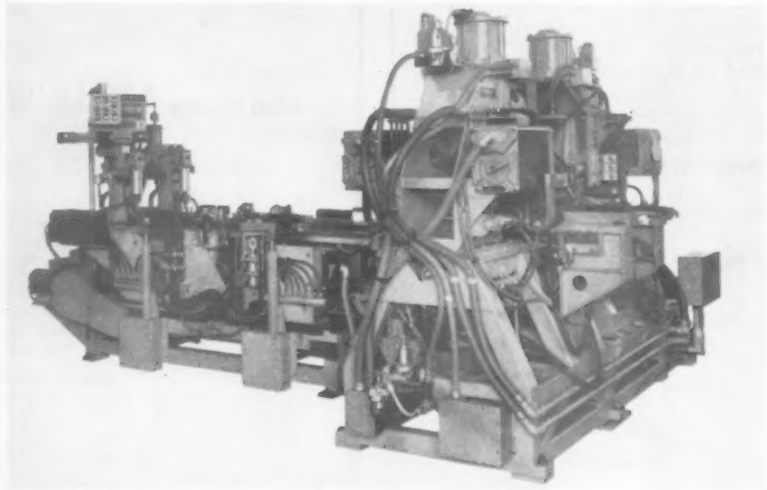


Automatic Flash Welder For Assembly Of Tube Systems

This automatic flash welding machine (Type SVU, size seven) is marketed by ASEA Electric, Inc. The machine is rated at 150 KVA at 50 percent duty cycle. It has hydraulically operated horizontal clamping devices for the assembly of tube systems up to maximum tube OD of 5½-inches. Upsetting is motor-operated. Maximum clamping force is 40,000 lbs; maximum upsetting force is 27,000 lbs.

Circle No. 12 on Reader Service Card.



Multi-Gun Combination Spot and Projection Welder

This special multi-gun flat top combination spot and projection welder with bending unit has been developed by the Federal Machine & Welder Co. The machine forms and welds range oven frames at a rate of 165 assemblies an hour.

Circle No. 206 on Reader Service Card.

Water-Cooled Ignitron

The Type 7585 is a water-cooled ignitron with provisions for mounting a thermostatic control unit. It features a helical copper cooling system which encircles the hottest part of the tube. This ensures a uniform flow rate and efficient use of cooling water. When equipped with suitable thermostatic switches, it reduces water consumption and protects the tube and associated equipment from overloads and overheating.

Made by Amperex Electronic Corp., the 7585 features rapid replacement, easily accessible ignitor terminals and has a red plastic coating which provides a visual warning to avoid touching live tube envelopes in a cabinet.

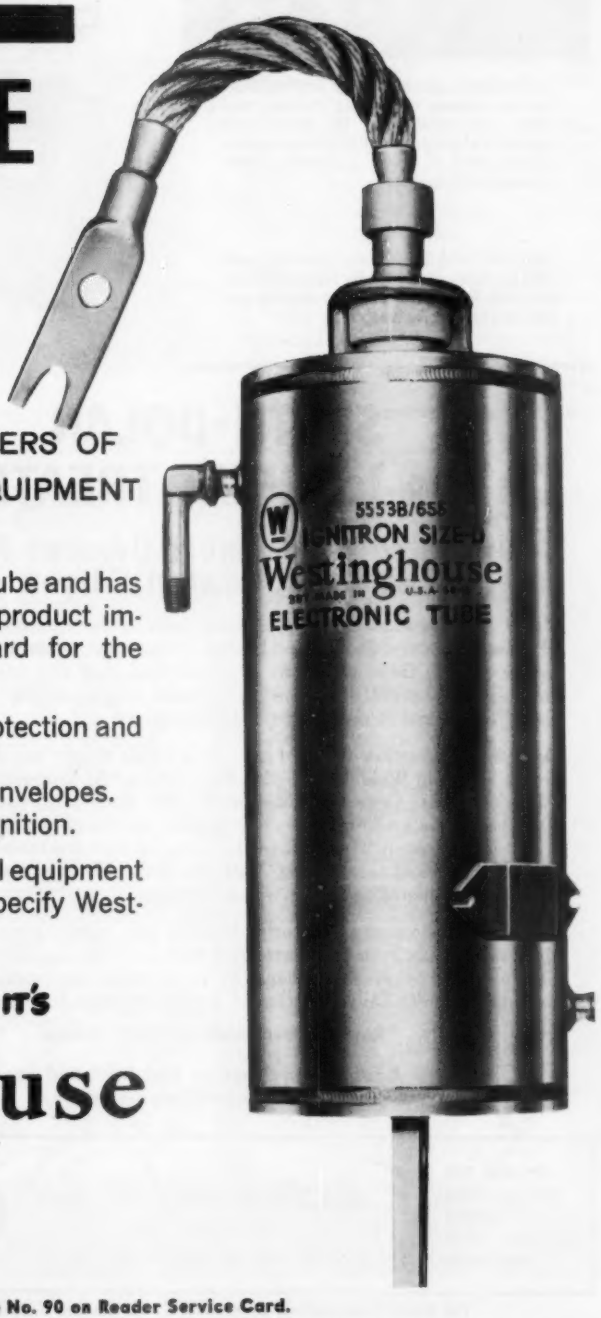
It is designed for use in single phases welding control and similar control applications.

Circle No. 207 on Reader Service Card.

INVENTED AND IMPROVED BY WESTINGHOUSE...SETS THE INDUSTRY STANDARD!

WESTINGHOUSE IGNITRON TUBES

CHOICE OF LEADING MANUFACTURERS OF QUALITY RESISTANCE WELDING EQUIPMENT



Westinghouse developed the Ignitron tube and has maintained constant leadership with product improvements that set today's standard for the industry:

- Thermostatic control for overload protection and water savings.
- Kovar seals permit the use of steel envelopes.
- Improved ignitors assure accurate ignition.

For your replacements, insist on original equipment performance and reliability—always specify Westinghouse Ignitron tubes.

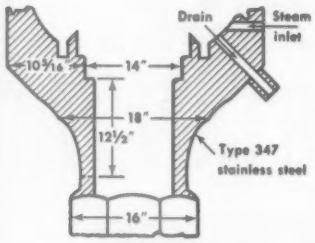
YOU CAN BE **SURE**...IF IT'S

Westinghouse

Electronic Tube Division, Elmira, N. Y.

For More Information Circle No. 90 on Reader Service Card.

Profit through E.A.I. Research



Uniform, through-and-through heating of the thickest sections of the big stainless steel valves was provided by the Smith-Dolan method, with precision control of temperatures (2-hour dwell at 1900°F.). Drawing shows cross-sectional dimensions.

Standard Smith-Dolan units come equipped with eye hooks and wheels for easy portability, and with instrumentation for recording permanent charts of the heat run.

SMITH-DOLAN On-the-Job HEAT TREATMENT

Solution to Weld Embrittlement Problem at Consolidated Edison

Public utilities are among the largest users of the Smith-Dolan System of Low-Frequency Induction Heating. They want to keep their service uninterrupted, their costs low, and they find that this portable system simplifies the problem of pre-heating and post-annealing in producing sound welds, and in making dependable repairs.

A typical application of the system by a public utility was described in a recent article in Welding Design & Fabrication.* At Consolidated Edison's No. 10 Turbine Generating Station in New York City, two large steam pressure valves made of Type 347 stainless had to be repaired because of weld embrittlement. Removal to the shop for heat treatment would have proved costly and time taking. With the Smith-Dolan portable units, the work was completed on the job within 12 hours.

Learn about the savings and other benefits your company can obtain from the Smith-Dolan System. It is today's most versatile heat treating method, simplifies and upgrades work quality in numerous applications. Write for brochure, "Smith-Dolan System of Low-Frequency Induction Heating."

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Rental Against Purchase — Get first-hand proof in your own plant without capital investment.

DEMAND THE BRAND MADE BY PEOPLE WHO BUY YOUR PRODUCTS

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Newark 8, New Jersey
ELECTRIC-ARC

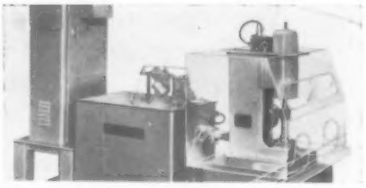
For More Information Circle No. 27 on Reader Service Card.

Welding Heat Control

Sciaky Bros. has announced a new optional form of heat control: the Automatic Voltage Compensator (AVC) for Sciaky resistance welding machines of the Dekatron type. The unit reduces and even eliminates excessive voltage fluctuations and weld inconsistencies.

Electronic circuitry of the AVC automatically shifts phase of firing pulses which control the heat regulating function of thyratrons within the power rectifier cabinet. By advancing the phase of these pulses when line voltages surge or drop within plus or minus 10%, weld current can be held to within plus or minus 2% or less at any given setting on the heat control dial. Full correction is made within one-third of the cycle.

Circle No. 208 on Reader Service Card.



Controlled Atmosphere Welding

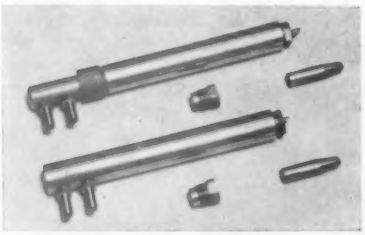
Designed for welding semiconductors and other small electronic parts under controlled atmosphere conditions, the new C-type magnetic force welding gun developed by Precision Welder and Flexopress Corp., fits easily into standard dry boxes. It is the first standard resistance welder to be made specifically for this purpose.

All air, water, and electrical supply lines are carried to the electrodes inside a hollow C-frame. This compact design leaves a minimum of area for sealing to dry box walls and gives maximum clearance around the welding area for handling material in and out of the electrodes.

The rugged frame and short throat maintain electrode alignment and surface parallelism. A popular size unit develops 2200 lb. weld pressure and accommodates transistor assem-

blies having ring projection diameters up to 1.250 inches. Precision also makes other sizes.

Circle No. 209 on Reader Service Card.



Spot Welding Tip Holders

A new line of straight resistance welding tip holders has been introduced by Air Reduction Sales Co., Inc., manufacturers of Tuffaloy resistance welding tips and alloys.

Holders are of two types. Lowest in cost is the Goldspot non-ejector type. The Goldcrown ejector-type utilizes an entirely new method of tip ejection that is rugged and will not leak coolant water.

Both holder types use adapters to take the brunt of the wear (in the tip socket) and to permit interchangeability of tip size by simply changing adapters.

Adapters with four different tip socket sizes are made to accommodate all current tip sizes, including the new No. 6 RW (¾-inch) size.

Circle No. 210 on Reader Service Card.

Versatile Spot Welder

A versatile new spot welder built by Peer, Inc., quickly converts to specific applications. Known as the Series 300, the welder converts to foot, air rocker, or air press operation quickly without drilling holes, welding or similar construction. Uni-Strut construction is said to be the most rigid ever available on a spot welder.

Adjustable throat design lets the user move the welder arms in or out; lower arm may be raised or lowered. Both may be raised or lowered on press-type welders. Continuous heat control is also a standard feature which offers an infinite number of current adjustments down to 20%.

A dual voltage feature is another first on standard spot welding equipment, state Peer engineers. The welder can be connected to a 220 or 440 volt service without replacing any components.

A concealed water hose removes hose from working area.

Slim-clearance ejector holders allow slipping a tube or box over the horn for welding with an inside dimension as little as 3 inches.

The unit's Class H Silicone-insulated transformer is said to be the first available in any standard spot welder.

Circle No. 71 on Reader Service Card.

Coaxial Ignitron

New coaxial ignitron, GL-7670, was developed by General Electric to control high peak currents as in resistance welding. New design feature is cathode terminal at top of tube which permits coaxial flow of current. This sets up magnetic sheath to protect the tube from damage which could result if the arc inside the tube were deflected by external magnetic fields created by high currents.

Available for immediate shipment, the GL-7670 is the first of a family of coaxial ignitrons, to be introduced by General Electric, which will employ the same design principles but will have different ratings.

The new tube can handle peak currents as high as 1300 amperes at peak voltages up to 1800 volts. In addition, it meets standard size "B" welder ratings and has the same basic tube dimensions as the standard size "B" welder ignitron.

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Arc Spot Weld Gun

MODEL H. Patented

SPOT WELDS FROM ONE SIDE

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NO-NO-NOT ANOTHER LEAKER!
ALL OUR EJECTOR HOLDERS LEAK, DOC! AND I'M NOT MISTREATIN' 'EM—I'M NOT!
JOE'S NO PSYCHO, MR. FOREMAN. WHY NOT LET HIM TRY A GOLDCROWN?
GOTCHA, DOC! JOE'LL HAVE A GOLDCROWN TOMORRA!
New Tuffaloy Goldcrown Ejector Holder ends leakage. Seals are protected from shock and grit. One Goldcrown user made 25 million welds without a leaker.
Goldcrown man-size ejector head ends sticking. For Goldcrown details write your nearby Airco or Tuffaloy office.
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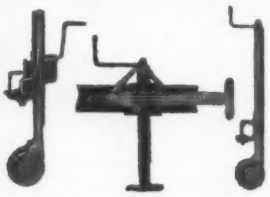

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Nu-Twist System

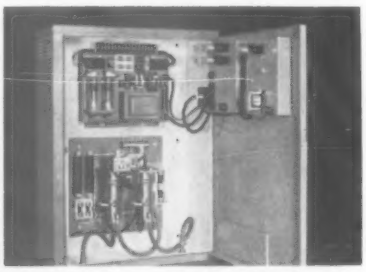
There are two primary features of the Nu-Twist system just introduced by P. R. Mallory & Co., Inc. First, flat electrode base is mated to flat surface to eliminate electrode seizure in holders, even at high welding pressures. Second, side insertion and removal of electrodes, which are held in place by hex locking nut, permits them to be changed with a minimum of open height.

Other advantages: maintenance of fixed height of electrode from base, positive electrode alignment with holder or base and easy radial alignment of electrode.

Mallory has developed Nu-Twist threaded adaptors for use in holders and as building blocks for die bases and multi-spot machine backup electrodes. The company also offers surface-mounted units (see photo) for dies and backups and has hydraulic equalizing adapters which make it easy to convert a single-spot machine to multi-spot.

Electrodes designed for use with the Nu-Twist system have no tapers nor threads. Any contour in the electrode face can be relocated in a given position.

Circle No. 213 on Reader Service Card.



Spike Power Control Unit

Spike Power is a system of pulse power resistance welding developed by the Robotron Corporation. The name is indicative of the high current, short duration pulses, or spikes, of power which are produced during the welding cycle. Spike Power is said to combine all of the advantages of conventional resistance, capacitor discharge, and percussion welding with few or none of their disadvantages.

Spike Power is of interest because of many new applications which fall within its present range of capabilities and the broad potential it presents for improving quality and cutting costs. Many metals which have been difficult or impossible to weld can now be successfully worked. These include, aluminum, vinyl-clad steels and dissimilar metals.

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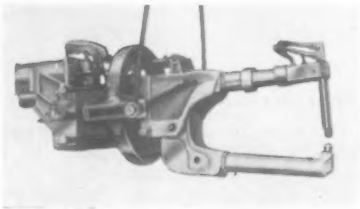

King-Sized Welding Gun

A remarkable new king-sized welding gun is the latest addition to the Aro line of portable spot welders made by ARO Spot Welders, Division of Guthery Machine Tool Corp.

The Model 510 welder has the following characteristics: 18,000 amps and 1350 lbs. pressure. It is air-operated, fully-automatic, water-cooled and will weld from the lightest gauge up to 2 x 3/16 inch. It is equipped with gyroscopic suspension for easy rotation in all directions.

Circle No. 214 on Reader Service Card.

Electronic Welder Control

Weltronic Company has introduced a new all-electronic NEMA N2 welder control designed for general use. It provides features normally furnished with special automotive-type controls. High speed performance is not sacrificed. Optional functions available as plug-in features include slope, post heat, forge, and electronic firing of valve and contactor.

Circle No. 215 on Reader Service Card.

Projection Welders

Special press-type projection welders have been introduced by United Welders, Inc. These air-operated size #4 units have 500 KVA welding transformers and 50 inch throat depths. Each machine contains an upper horizontal-mounted, four-station, radial-type fixture plate. Welding dies are mounted in each station on the fixture plate and are designed to locate and weld various mounting brackets to distribution transformer tanks. The upper fixture is power-indexed by an air motor and any weld pattern can be selected. The lower knee support contains a telescoping unit for the tank.

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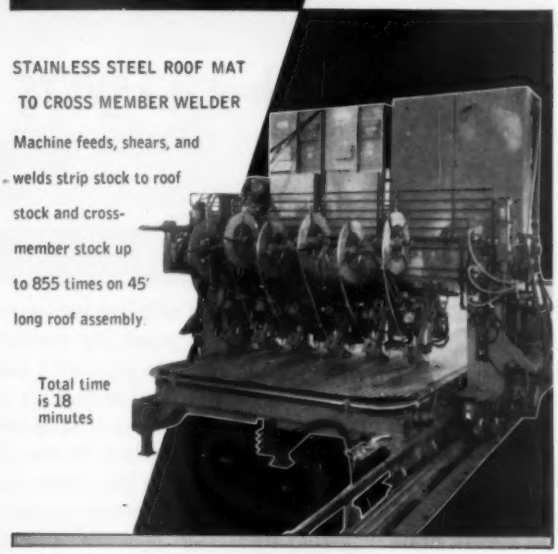
TRAILER ROOF MAT SEAM WELDER

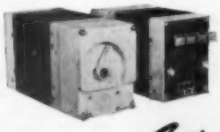
Welds four seams in one direction, shifts, and welds remaining four seams. Length of seam varies from 21 to 45'.

STAINLESS STEEL ROOF MAT TO CROSS MEMBER WELDER

Machine feeds, shears, and welds strip stock to roof stock and cross-member stock up to 855 times on 45' long roof assembly.

Total time is 18 minutes





Transformers

Standard fixture and Gun-Type resistance welding transformers from 10 to 500 KVA ratings; or to your specifications. 30,000 now in operation.

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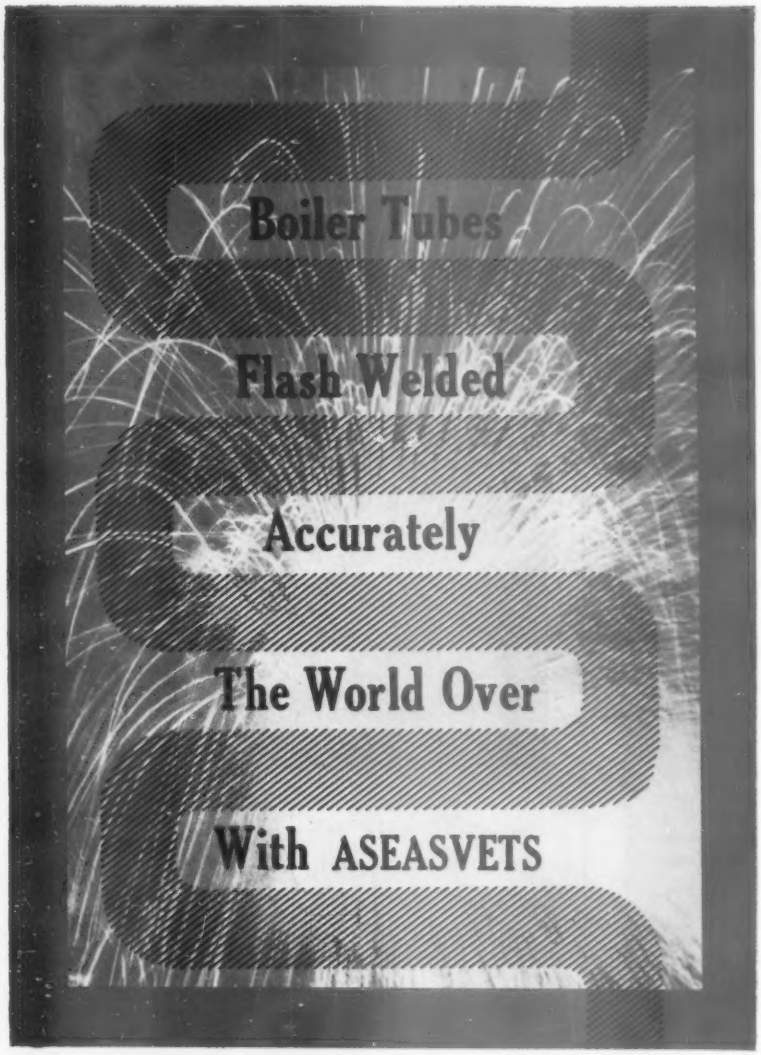

The ASEASVETS Tube Flash Welder, world renowned for accuracy, includes automatic internal flash and upset reduction in preformed tube elements. Elements with tube spacings down to ½ inch can be welded. The ASEASVETS Boiler Tube Welder takes M.S., Cr. Mo., Stainless Steel and many others. Welders are complete with hydraulic clamping equipment, motor operated pre-heating, flashing and upsetting. Maximum welding surface up to 6 sq. in.; max. clamping force 30 tons; max. upsetting force 20 tons; max. O.D. up to 7". Also from ASEASVETS: Chain Welders—complete mills or individual units. Seam Welders—foot and air operated machines for steel, stainless steel or non-ferrous metals. Projection Welders—for production welding of small and medium sized parts. Spot Welders—highly economical for materials usually soldered or riveted. Resistance Heaters—for bolt blanks. Electrodes—Ordinary electrodes and electrodes with unusually deep penetration. Send coupon for free literature.

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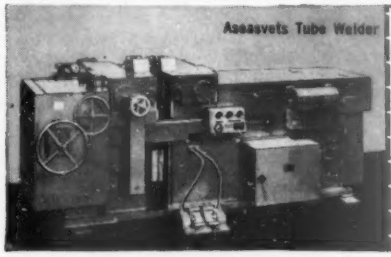

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For More Information Circle No. 12 on Reader Service Card.

Semi-Automatic Welder

This semi-automatic multi bench welding head welder with two (2) capacitor discharge power supplies is designed to weld small electronic components into complete assemblies. Manufacturer is Robt. W. Hoffman Co., Inc.

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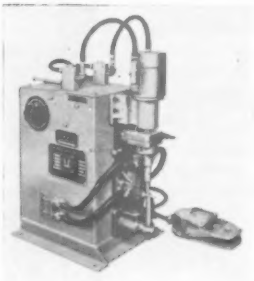

New Bench Welder

A small, press-type bench welder designed for extra fine and critical welding has been announced by the Universal Electroweld Division of Electric Arc, Inc. The machine brings a higher capacity and a wider work range to the same type of fast, sensitive and automatic operation which had been the special field of the tweezer-type and miniature press welders, according to Otto Kriesel, chief engineer.

Produced in models with capacities from 5 to 50 KVA, the new machine is air-actuated, has adjustable upper and lower arms and holders, and comes equipped with a foot switch. A light-metal ram operating in a lineal ball bearing sleeve and a precision diaphragm cylinder give the machine its adaptability to fine, critical welding.

Circle No. 218 on Reader Service Card.

Utility Drum Welder

Flexible band clamp is a feature of this low-production, low-cost barrel welder developed by National Electric Welding Machines Co. Clamp

achieves narrow lap, eliminates end splitting.

The machine mash seam welds containers from 14-inches to 22½-inches in diameter and up to 40-inches long. A single operator manually loads sheet into the clamp; he can turn out 250 55-gallon drums an hour. The machine automatically ejects welded cylinders.

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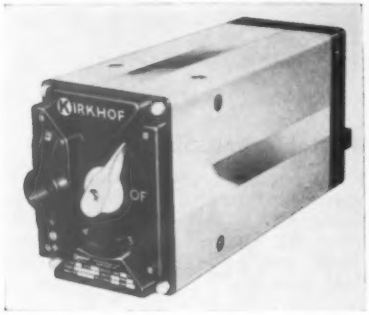
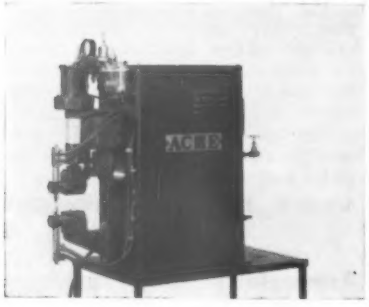


Welding Transformers

A new line of epoxy-insulated transformers rated at 60, 70, 90, and 130 KVA have been announced by Kirkhof Mfg. Corp. Called Epoxy-Pak, units can take a 110°C temperature rise safely for high production welding. With the higher ratings this means up to 30% more heat capacity for the user. It also means longer operating life and better protection against intermittent overloads.

Epoxy has greater bonding strength than varnish, virtually eliminates hot spots, and is unaffected by most deteriorating agents.

Circle No. 220 on Reader Service Card.



Bench Model Press Welder

This bench-type press welder is made in sizes from 10 to 30 KVA by Acme Electric Welder Co. It is used when fast follow up pressures are required for welding ferrous and nonferrous materials.

The welder's ram is guided with linear ball bushings. The transformer and secondary circuits are water-cooled.

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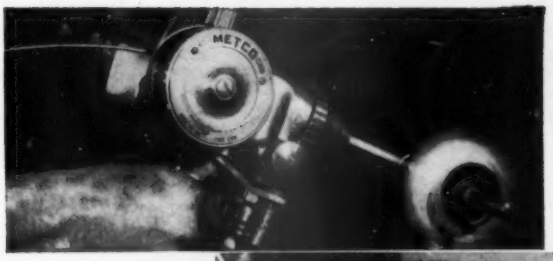
Complete your shop with this modern metallizing installation



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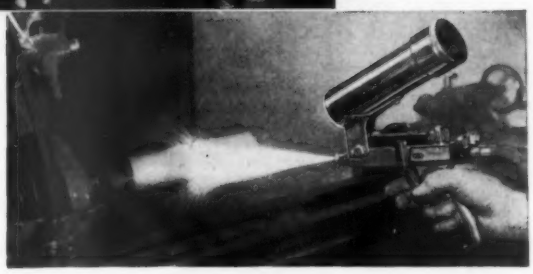

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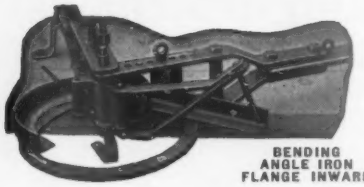

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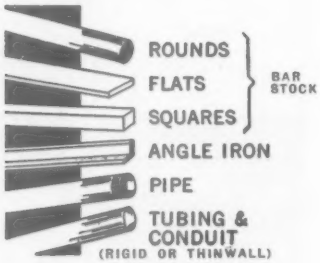

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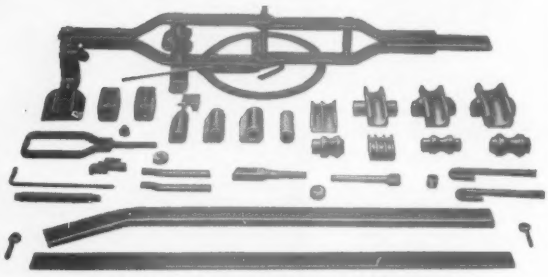

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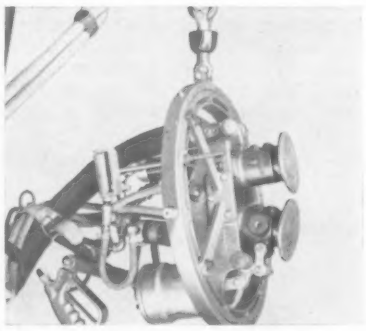

Portable Roll Spot Welder

A portable welder has been designed by Progressive Welder and Machine Co. to weld three thicknesses of metal. The new unit has synchronized, double-wheel, air motor drive and provides clamping pressures up to 1000 lb. Despite this, it is compact and lightweight and will weld at speeds up to 250 ipm. Spot frequency is adjustable from ½ to 1½ inches. The unit is accurately counterbalanced for easy operation.

Circle No. 222 on Reader Service Card.

Spike Welder

A new spike welder for blemish-free welding of coated metals and for welding of non-ferrous metals, dissimilar materials and delicate parts has been developed by Weldex Division of The Metal/Craft Company. The machine is said to combine the advantages of normal capacitor discharge spot welding and percussion welding and eliminates or nullifies most of their disadvantages.

The new welder produces 100,000 plus ampere pulses of approximately one millisecond duration, yet requires no additional service lines. Because the spike welding method generates heavy currents in very short times it offers equivalent welds with a much smaller machine than would be normally used.

Circle No. 223 on Reader Service Card.

Remanufactured Ignitron Tubes

Ignitron tubes remanufactured by Industrionics, Incorporated, carry a full year's warranty. Everything in the remanufactured tube is replaced except the metal shell. This is reused to cut costs.

All old parts, including the igniter, are discarded. Pure, clean mercury is scientifically measured into the tube; pumps restore the correct vacuum.

The finished tube is tested, both on an electronic test panel and in actual welding equipment.

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TOGGLE CLAMPS

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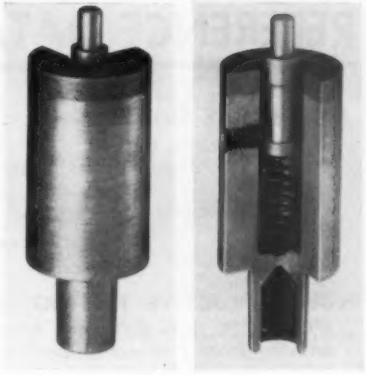

Dual-Purpose Electrode

The retractable pilot on Ohio Nut & Bolt's new dual-purpose electrode makes accurate center-line positioning on Ohio pilotless nuts and spacers almost automatic. When the upper electrode is lowered the pilot pin is depressed into the pin well. Wear on the stainless pilot is negligible. The sharp edges of holes in sheets will not damage it. Should the upper electrode be accidentally lowered on the pin without an assembly in position to be welded, the pilot is simply depressed without injury.

To switch from welding pilotless nuts and spacers to through-hole nuts, screws, or pins, the stop-screw in the side of the electrode is loosened and the pilot pin and spring slipped out. It takes seconds and eliminates the need for changing dies.

Electrode has a tungsten-copperalloy facing that is said to outlast conventional electrode facing 6 to 1.

Circle No. 225 on Reader Service Card.

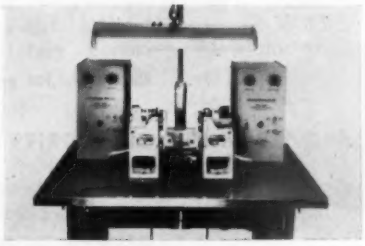

Table Model Welder

Tweezer-Weld, Federal Tool Engineering Co. announces a new table model dual welder for welding transistor tab to header. Precision engineered and field tested, this unit consists of two standard Tweezer-Weld Trans-Sync Synchronous Controls, Model T-3, two standard vertical welding heads, Model TW-5, and a special fixture for welding the tabs to the header.

Welding is controlled and initiated by a single foot pedal, the two welding heads are synchronized so that the two welds are made almost simultaneously.

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IT'S A FACT

YOU CAN DO BETTER WITH

DE-STA-CO

TOGGLE CLAMP DELIVERY

BECAUSE, with stocking Distributors from coast-to-coast, you can always get quick delivery of the right clamps for the work at hand ... WHEN YOU NEED THEM!

Whatever the size or shape of the piece to be held—wherever you have to push, pull or lock with forces from 50 to 10,000 pounds—it's a hundred-to-one there's a DE-STA-CO Toggle Clamp in stock to fit the job exactly.

FOR YOUR NEARBY DISTRIBUTOR CONSULT YOUR YELLOW PAGES!

FOR MORE FACTS
WRITE FOR TEMPLATE SET AND CLAMP CATALOG

YOU CAN DEPEND ON DE-STA-CO

DETROIT STAMPING COMPANY
350 MIDLAND AVENUE
DETROIT 3, MICHIGAN

Circle No. 22 on Reader Service Card.

PINK DIAMONITE

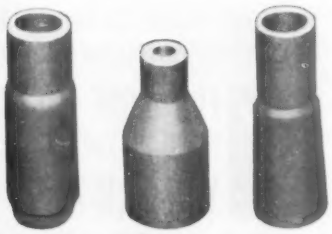
Welding Cups, Shields, Nozzles for Longer Service Life Better Welding

Chosen as standard equipment by leading manufacturers, Diamonite high alumina pink ceramic has proven itself as the ideal material for welding cups and nozzles. In hundreds of comparative tests, it has consistently shown its outstanding qualities.

Diamonites' chemical inertness and non-porous properties help to eliminate weld contamination from the cup and assure absence of unwanted gases. The combination of high mechanical strength and heat resistance assures long service life.

Diamonite Alumina Ceramic custom shapes to be used as insulators, locators, guides and supports are available for heating, welding and brazing operations. Solid cylindrical rods and tubes and square and triangular rods, in a wide range of sizes, are carried in stock.

If your distributor cannot supply you with Diamonite welding accessories, write direct for location of nearest dealer.



DIAMONITE®

products mfg. co.

SHREVE, OHIO. DEPT. WD-6

Circle No. 24 on Reader Service Card.

REFERENCE DATA *catalogs, handbooks, manuals*

A COMPLETE SURVEY of aluminum welding, brazing, and soldering is included in a comprehensive, practical, 40-page illustrated manual issued by All-State Welding Alloys Co., Inc. A complete list of All-State's aluminum joining products and fluxes is included with Government specifications covered by these alloys.

Circle No. 300 on Reader Service Card.

NONDESTRUCTIVE TESTING and spot welding equipment for the electronics and airframe manufacturing fields are featured in a catalog from Pioneer Industries Division of Almar-York Co., Inc.

Circle No. 301 on Reader Service Card.

A SPOT WELDING ATTACHMENT engineered to fit all spot welders having standard electrode holders is featured in catalog sheet from Atomic Spot Welding Co. Unit is attached without removing horns and can be used to make butt and T-joints up to ⅜-inch in diameter.

Circle No. 302 on Reader Service Card.

FOUR MAJOR SECTIONS of safety material handling equipment and accessories are in new Catalog No. 60 issued by E. D. Bullard Co. Covered are safety hooks, high voltage insulated tension links, vehicle back-up alarms, and safety truck steps.

Circle No. 303 on Reader Service Card.

NEW COMPARISON CHART lists 23 NCG filler rods for use in welding nine different metals along with competitive brands. Chart N-126 issued by National Cylinder Gas Division of Chemetron Corp. gives the names and numbers of rods sold by NCG and by 22 other major suppliers.

Circle No. 304 on Reader Service Card.

COLORFUL WALL CHART offered by Ampco Metal, Inc., contains data of value to users of resistance welding electrodes and accessories. The stain-resistant 20½ by 29½ inch metal-edged chart (RW-5) gives specifications and schedules for spot, seam, and projection welding various metals and metal combinations.

Circle No. 305 on Reader Service Card.

ARC WELDING ACCESSORIES made by Lenco, Inc., are the subject of a handy pocket-size folder. Featured are electrode holders, cable attachment and ground clamps. Company's threaded power connection for keeping arc welding circuits cool is explained in detail.

Circle No. 306 on Reader Service Card.

EYE AND FACE PROTECTION equipment made by Sellstrom Mfg. Company is featured in a colorful 28-page catalog. Catalog No. 36 gives illustrated descriptions of goggles, glasses, helmets, face shields, lenses, respirators and other products.

Circle No. 307 on Reader Service Card.

THREE NEW MODELS of plunger-type toggle clamps just added to the Detroit Stamping Company's standard clamp line are featured in Bulletin #601606. Prices, specifications, and full-size tracing temperature also included.

Circle No. 308 on Reader Service Card.

FACTS AT YOUR FINGERTIPS: *If you want copies of the catalogs featured on these pages, just circle the appropriate numbers on the bound-in Reader Service Card. We'll do the rest.*

"VEST POCKET GUIDE to Better Welds," a revised edition of "How to Get Better Welds," contains 80 pages of arc welding information. The 6½ by 3¾ inch booklet is available from Hobart Bros. Co.

Circle No. 309 on Reader Service Card.

WELDERS HELMET PLATES and various types of spatter-proof cover lenses are featured in new literature and price lists issued by Thermacote Company.

Circle No. 310 on Reader Service Card.

A NEW COMPACT LINE of arc welding machines introduced by A. O. Smith Corp. is featured in literature. Explained is how welders can be stacked, racked or slid under a bench. Customized accessories, including DC conversion, are described.

Circle No. 78 on Reader Service Card.

CONSTANT VOLTAGE power supplies with slope control for welding space age materials are featured in a new 4-page brochure from Glenn Pacific Power Supply Corp. Features, applications and specifications are given.

Circle No. 312 on Reader Service Card.

IGNITRONS that have high-peak current conduction capacities are featured in literature from Westinghouse's Electronic Tube Division.

Circle No. 90 on Reader Service Card.

HOW SPIKE POWER electronic control and power system developed by Robotron Corp. makes it possible to resistance weld metals like aluminum and vinyl-clad steels is explained in a catalog.

Circle No. 74 on Reader Service Card.

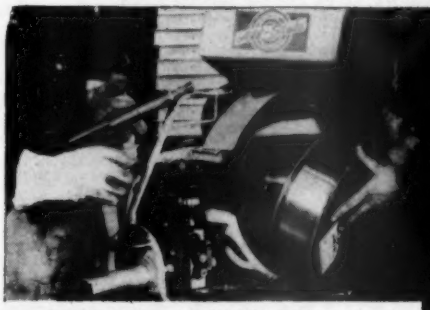
VERSATILE Series 300 spot welder that quickly converts to foot, air rocker or air press operation is described in literature from Peer Incorporated.

Circle No. 71 on Reader Service Card.

ECCENTRIC GEAR PRESSES with capacities from 100 to 1500 tons are described and illustrated in 12-page bulletin from Federal Machine and Welder Co.

Circle No. 316 on Reader Service Card.

For More Information Circle No. 5 on Reader Service Card.



Loading 10 lb. spool of #4043 aluminum wire at Michael Flynn Manufacturing Co., Philadelphia. Aluminum in this particular spool was used in welding curtain walls for skyscraper at 2 Broadway, New York City.

now you can get
All-State Spoolarc

SPOOLED ALUMINUM

in all grades, all types
precision layer level
wound on
1 lb. and 10 lb. spools

Wire goes from extrusion and light draw to ALL-STATE'S precision spooling machines where it is layer level wound for smooth, trouble-free welds.

Types available: 1100, 4043, 5052, 5154, 5183, 5356, 5556, 6061, 6063, *355,* 356, 716, 718.

Precision spooled in these sizes: .030, .040, 3/64, 1/16, 3/32, 1/8.
*down to 1/16 only

ALL-STATE *Spoolarc*® spooled aluminum wire meets federal and industry specifications. Spools are sealed in polyethylene bags plus desiccant to retain top quality from spooling machine to welding machine.

Complete stocks available from factories at White Plains, N. Y. and South Gate, California . . . and from branches at St. Louis, Missouri and Toronto, Canada. On sale at over 1000 distributors here and abroad.

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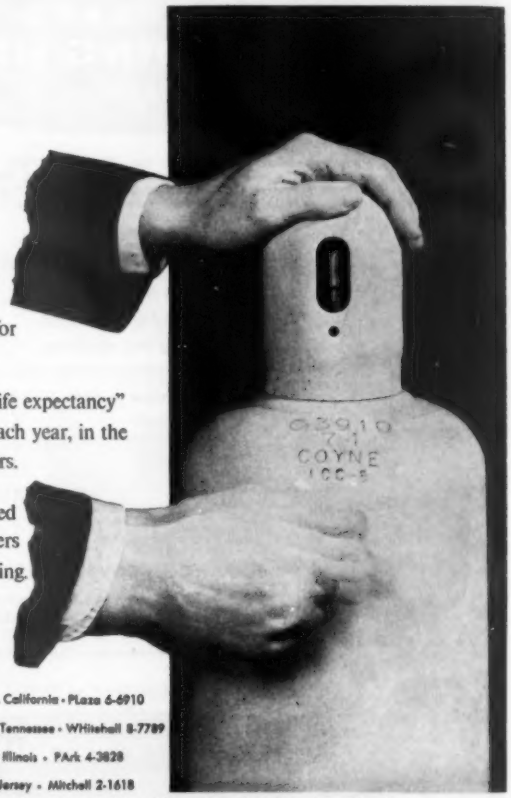
Distributor Stocked, convenient to buy. Economical to use.
ALL-STATE WELDING ALLOYS CO., INC., White Plains, N. Y.
Call WHite Plains 8-4646 or write for nearest distributor

Your steel-clad investment



EXTRA PROTECTION. Coyne's stronger steel shell protects the cylinder (inside and out) for virtually a "lifetime".

EXTRA VALUE. This longer "life expectancy" means greater appreciation, each year, in the value of your Coyne Cylinders.

EXTRA DIVIDEND. The increased gas capacity of Coyne Cylinders means less refilling, less handling.

Write or call now!
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155 West Bodley Avenue, Memphis, Tennessee • WHitehall 8-7789
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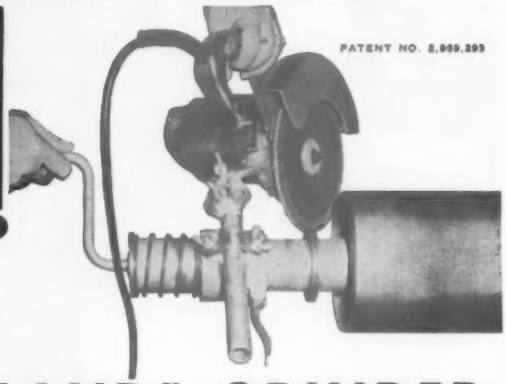
24 Commerce Street, Newark, New Jersey • Mitchell 2-1618

For More Information Circle No. 20 on Reader Service Card.

For More Information Circle No. 40 on Reader Service Card.

NEW! H&M



"BEVEL-LAND" GRINDER

automatically cleans and lands pipe bevels

The new H & M "BEVEL-LAND" GRINDER employs an electric grinder to automatically clean and smooth pipe cuts and put the land on bevels. The machine may be placed on the pipe and in operation in less than one minute. A simple adjustment in angle of the grinding wheel is all that is required to change the machine from the cleaning to the land position. The H & M "BEVEL-LAND" GRINDER assures more postive alignment of pipe and better quality welds. The machine is available in two models: one for 6" to 14" and one for 14" to 36" pipe.

WRITE FOR YOUR COPY OF A CATALOG SHEET WHICH DESCRIBES ALL THE FEATURES OF THE NEW H & M "BEVEL-LAND" GRINDER.

H&M TM Reg

PIPE BEVELING MACHINE COMPANY
311 E. Third St. DI 3-0241
TULSA, OKLAHOMA

Flood FIBER GLASS WELDING HELMETS

For Safety, Comfort and Economy

These seamless fiber glass units (of thermo-setting, polyester resin) are compression-molded and stoutly reinforced to afford maximum protection. All are fitted with the new Fit-Rite, snap on, ratchet type headgear—the most comfortable, durable and easiest-to-maintain you can buy, and not more expensive.

NEW DESIGN ADVANTAGES

1. Lighter weight for more comfort.
2. A smoother and stronger shell.
3. Easier cleaning and sterilizing.
4. Non-warping moisture-proof construction.
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No. 51-8F-2H

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Enjoy real savings with Flood's

1000-HOUR COVER LENS

Outlasts 125 glass lenses. Reduces eye fatigue. Safer because shatter-proof.

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3037 WEST LAKE STREET, CHICAGO 12, ILLINOIS

For More Information Circle No. 34 on Reader Service Card.

USEFUL LITERATURE *continued*

AN ELECTRONIC welder control for use on hard-to-weld alloys is featured in Bulletin 8993 from Square D. Company. Bulletin explains how control gives precision welds on stainless, aluminum, magnesium and air-hardenable steels.

Circle No. 79 on Reader Service Card.

ABRASIVE CUT-OFF MACHINES are described and illustrated in Catalog DH-460-C issued by Allison-Campbell Division of American Chain & Cable Co., Inc. Specifications are given for a complete line of wet- and dry-cutting machines.

Circle No. 317 on Reader Service Card.

RESISTANCE WELDING supplies for all spot and seam welding operations are featured in a catalog from S-M-S Corporation. The design and building of special electrodes and fixtures is described.

Circle No. 77 on Reader Service Card

"A PROGRESS REPORT on Continuous Fluoroscopic Inspection of Submerged Arc Welded Line Pipe" is the title of a 12-page booklet available from Philips Electronic Instruments. The illustrated booklet covers all phases of fluoroscopic inspection.

Circle No. 318 on Reader Service Card.

COMPREHENSIVE CATALOG issued by Tippaloy, Inc., describes and illustrates complete line of resistance welding tips, wheels, forgings, castings, holders, and adapters.

Circle No. 84 on Reader Service Card.

INFLATED POLISHING WHEELS and expanding polishing wheels, sanding drums, belt sanders, and expanding cones are featured in new literature and catalogs from Nu-Matic Grinders Inc.

Circle No. 319 on Reader Service Card.

SPOT WELDERS, welding tips, holders and resistance welding accessories are featured in a complete catalog issued by Eisler Engineering Co.

Circle No. 26 on Reader Service Card.

Tempilstik°

*temperature indicating crayons**

Tempilstik°—a simple and accurate means of determining preheating and stress relieving temperatures in welding operations. Widely used in all heat treating—as well as in hundreds of other heat-dependent processes in industry. Available in 80 different temperature ratings from 113°F to 2500°F . . . $2.00 each.

Send for free sample Tempil° Pellets. State temperature desired . . . Sorry, no sample Tempilstiks°

Most industrial and welding supply houses carry Tempilstiks° . . . if yours does not, write for information to:

SALES DEPARTMENT

Tempil° CORPORATION
132 West 22nd St., New York 11, N. Y.

Circle No. 81 on Reader Service Card.

RESISTANCE WELDING MACHINES and fixtures, automatic arc welders, and resistance welding transformers are the subject of a catalog available from Goodrich Welding Equipment Corp.

Circle No. 38 on Reader Service Card.

LATEST DEVELOPMENTS in welded bridge construction are the subject of an 8-page reprint article by La Motte Grover. Released by Air Reduction Sales Co., article describes the Highway Research Board's forthcoming publication on this subject. The American Welding Society's recommendations for field inspection are also discussed.

Circle No. 320 on Reader Service Card.

HOW REMANUFACTURED ignitron tubes (f.o.b. factory exchange) save almost 50 percent of new tube costs is explained in literature from Industrionics, Inc. A one-year warranty and trial use are described.

Circle No. 46 on Reader Service Card.

HIGH ALUMINA CERAMIC welding cups and nozzles and why they improve welding practice is the subject of literature issued by Diamonite Products Mfg. Co. Complete line of welding shields, cups and nozzles are featured.

Circle No. 24 on Reader Service Card.

COMPLETE LINE of resistance welders is the subject of an illustrated catalog sheet from Alphil Spot Welder Mfg. Corp. Complete specifications are given for the company's new ½ to 3 KVA air-operated, press-type bench welder.

Circle No. 321 on Reader Service Card.

LOCATING LEAKS in vacuum systems is the subject of Bulletin GET-2935 issued by General Electric Co. The 4-page booklet explains in detail how halogen-sensitive vacuum leak detectors are used to locate leaks down to 1 x 10^{-6} cc per second.

Circle No. 322 on Reader Service Card.

CONTROLLED VISION

Safety

thats why

THERMO-

FILTER PLATES and COVER LENS are *FIRST CHOICE* EVERYWHERE

Thermo Filter Plates guaranteed to have less variation in density. Blue-green tint eliminates fatigue and eye-strain.

Laboratory tests prove Sta-Kleer All-Plastic Cover Lens last longer because they are more heat and scratch resistant.

Triple-Duty Glass Coated Cover Lens outsell all others on the market because they repel molten weld slag. Will not peel or discolor.

INSURES GREATER

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Circle No. 29 on Reader Service Card.

engwald

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Discover why Engwald exhausts are preferred by hundreds of welding shops, garages, factories, plants where ventilation has been a problem. Efficient units clear away dangerous fumes at their source—before they can harm workers—save untold loss of manhours and money. All types from portable units, stationary units, to systems for multiple installations.

FREE ENGINEERING SERVICES—Our highly qualified engineers will assist you in designing an exhaust system most suitable for your needs.

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TILLMAN
GLOVES-GARMENTS

WELDORS BUY FROM YOUR DEALER

WELDING GLOVES MITTENS AND GARMENTS NOW IN POLY BAGS

BRAZILIAN DEERSKIN THE "STAY SOFT" LEATHER GLOVES AND MITTENS

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Your
LINDE Distributor
has it—

1. Service
Every authorized LINDE Distributor is an independent *local* businessman who knows your welding and cutting needs, has them ready for you, and satisfies you promptly.

2. Know-How
LINDE Distributors are welding supply *specialists.* Their technical background, practical experience, and knowledge of local industry can help you with your welding and cutting problems.

3. Superior Products
Your LINDE Distributor carries a *complete* line of industrial gases, equipment and supplies for your welding and cutting requirements. He handles only high-quality products of proved efficiency and best suited to your individual needs.

A telephone call to your nearby LINDE Distributor will bring you the benefits of more than 50 years of LINDE COMPANY's pioneering and leadership in welding and cutting. If you don't know your local LINDE Distributor, look in your classified telephone directory. Or write for further information to LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N.Y. *In Canada:* Linde Company, Division of Union Carbide Canada Limited, Toronto.

Linde UNION CARBIDE

The terms "Linde" and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

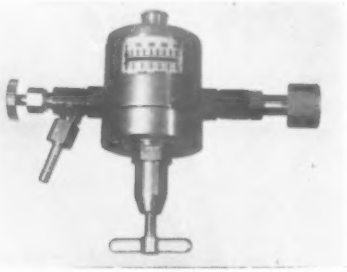
Circle No. 53 on Reader Service Card.

NEW PRODUCTS

Automatic Welding Wires

Air Reduction Sales Company markets a line of submerged arc welding wires made from selected heats of steel to give good physical and chemical properties. Included: low carbon, general mild steel, high tensile steel, highest tensile steel, mild steel killed, general high tensile and medium carbon steel. Wires are carefully wound to facilitate unwinding. They come in coils or in fibreboard drums in a number of weights.

Circle No. 227 on Reader Service Card.



Welding Gas Regulator

A new Swiss-made Gard-O-Gage regulator offered by Walker-Sanders, Ltd., is designed practically damage proof. Cylinder and working pressures are read on a shatter-proof gauge face; the pressure screw faces downward; the optional on-off valve shuts off gases quickly in case of fire without affecting set pressures for welding or cutting.

The regulator has standard connections, comes in two models for oxygen (20 or 280 psi working pressures) and one model for acetylene.

Circle No. 228 on Reader Service Card.

Magnetic Particle Tester

A new portable instrument has been developed by the Laboratory For Nondestructive Testing to simplify magnetic particle inspection of welds. The compact, lightweight unit (24 lb.) has two pole pieces which provide the shortest return for magnetic flux flow. The instrument has penetrating power to ⅜ inches, even through paint. Exchangeable pole pieces permit inspection of seam, butt, fillet, and circumferential welds.

Circle No. 229 on Reader Service Card.

Instrument Provides Quick Way To Sort Metals

A unique device which qualitatively sorts look-alike metals, quickly and simply, has been developed at the Knolls Atomic Power Laboratory, an operation of the General Electric Company.

Without special training, the device can be used to separate Inconel and stainless steel, zircaloy-2 and zirconium, and zircaloy-2 and hafnium. It consists of a standard milliammeter with two leads, a clamp on one and a small carbon steel file on the other. Metals are tested by attaching the clamp to the work and rubbing the file against it. This generates a tiny current (5-0 milliamps for Inconel and stainless steel) and points to the kind of metal being tested, on the instrument dial.

The operating principle of the sorter: the polarity of stainless steel is different from that of Inconel, in respect to carbon steel. This also holds true for the other metals it can separate.

Another application for the device is as a thermocouple tester. With it, thermocouples can be hooked up correctly and the circuit checked out. If no polarity is indicated, the circuit is not complete.

Circle No. 230 on Reader Service Card.

Weld Help Kit

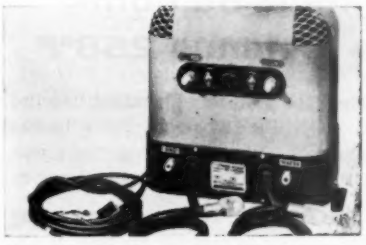
A sampling package of welding carbon, plate, rod and paste is being offered by the Arcair Company to acquaint welding operators with the advantages of using these products in doing difficult welding work. Included are: eight diameters of carbon rods, three thicknesses of plate, a can of carbon paste, a can of Protex—surface protection compound—and a well-illustrated manual showing numerous applications of the products.

Circle No. 231 on Reader Service Card.

Production Brazing Machines

Two tested production brazing machines have been announced by Boyd Welding Company. The machines gain the advantage of high production in conjunction with the use of silver brazing alloys. Both machines were designed to move assemblies rapidly through the heating cycle. Different assemblies can be brazed on the same machines with different holding devices, timing, and heat impingement. They are equipped with the adjustments. Minimum maintenance and maximum safety are design features of both machines.

Circle No. 232 on Reader Service Card.



High-Frequency Stabilizer

A new stabilizer for inert arc welding has been announced by Metal & Thermit Corporation. It is designed to convert any standard a.c. or d.c. welder for inert gas shielded welding of many metals. The unit supplies arc starting and stabilizing current without electrode contact of the work. It controls high frequency, gas flow, water and post gas flow with a single switch which can be remote.

Unit operates from a 230-volt source and has a 0- to 600-amp capacity.

Circle No. 233 on Reader Service Card.

Hose Adaptors

Western Enterprises, Inc. has announced four inert arc, air-water hose and machine adaptors designed to adapt new IAA standard fittings to old-style torches or machines. The adaptors are 2-piece, silver-soldered units equipped with swivel nuts to assure gas-tight seating.

Circle No. 234 on Reader Service Card.

KNOWING what you will need IS HIS BUSINESS

Your LINDE Distributor is an independent local businessman who concentrates on knowing what you are going to want and on having it ready for you. He's a welding specialist, too, with wide practical experience and intimate knowledge of local industry. Knowing is part of his job. Maintaining adequate stocks for immediate delivery is another.

So your LINDE Distributor carries a complete line of welding and cutting equipment, industrial gases, welding rods, and supplies. He handles high-quality products of proved efficiency and recommends processes and methods best suited to your needs. His resources, plus the benefits of LINDE's 50-odd years as a leader in welding and cutting, are as near to you as your telephone.

Talk to your LINDE distributor today. Get to know him better. If you can't find his name in your telephone directory, write to: Dept. 311, LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd St., New York 17, N. Y. *In Canada:* Linde Company, Division of Union Carbide Canada Limited, Toronto.

Linde

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Circle No. 54 on Reader Service Card.

Job report courtesy of
Conch Methane Co., Ltd.

when pipe joints must be completely dependable at minus 258°F

The engineers who successfully "broke through" the problem of handling liquefied methane gas on and off the "METHANE PIONEER" at minus 258°F had to "play it safe" in every respect. To provide unquestionably *safe* stainless pipe joints, Arcos EB Consumable Weld Inserts were used to make the important root passes.

EB Inserts permit welding to be done from one side only. They eliminate back-up ring obstruction and produce a smooth inside contour to expedite gas flow. If you are not familiar with the advantages of EB Weld Insert for "tough" pipe joining problems, write ARCOS.

*Trademark of General Dynamics Corp.

WELD WITH ARCOS

EB* WELD INSERT

ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.

For More Information Circle No. 9 on Reader Service Card.

300 Amp Ground Clamp

A new heavy duty ground clamp called Kool-Grip has been announced by the Twentieth Century Manufacturing Co. The ground cable runs through the extra-long handle to the heavy-duty jaws. This protects the cable at the entry point and almost eliminates current, therefore heat, in the handle. Other features: jaws open 2½ inches; built-in scale scraper insures good ground. Also available: handle insulators that stop current and heat from reaching the operator's hands.

Circle No. 235 on Reader Service Card.

Angled Lens Goggles

Glendale Optical Company has introduced a new design in welder's goggles that utilizes angled lenses. A slight tilt of the head and the wearer sees the entire work area—without fatigue. Other features: comfortable fit over large spectacles, indirect ventilation, flexible leather nose guard, lightweight construction. Name: Seesall Cover-Spec Goggles.

Circle No. 236 on Reader Service Card.

Cuts 24-inch Steel

A cutting torch with enough flow to cut 2-foot thick steel has been introduced by Smith Welding Equipment Corp. Called Tuf-Tony, unit was designed for heavy cutting but will do the lighter jobs too. Tuf-Tony features Ease-on oxygen control, an aid to slag spray reduction, piercing, washing, and heavy cutting. It has an over-or-under cutting lever that suits any operator.

Unit weighs under 4 lbs., is well balanced, and has a slip-proof grip. Comes in two lengths and two head angles and uses Slip-in tips.

Circle No. 237 on Reader Service Card.

Welding-Cutting Outfits

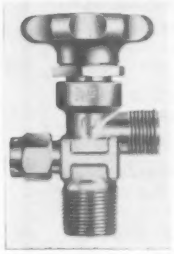
Two professional outfits are being packaged by Modern Engineering Co. The first: Weldmaster torch and cutting attachment with 3 welding and 1 cutting tip. Welds to ½-inch steel, cuts to 3-inch steel.

The second: Aviator-Jet welding torch and cutting attachment with tips. Welds to 5/16-inch steel, cuts to 1¼-inch steel.

Both outfits include regulators, goggles, wrench, flint lighter, 12½ ft. of Tu-line hose, and an instruction book. Both outfits will do heavier work with available tips.

Circle No. 238 on Reader Service Card.

Cylinder Valve



Short, light, sturdy, efficient, field-proven, describes the new Bastian-Blessing Company cylinder valve. It's less than 4-3/16 inches high; the low silhouette body design provides high efficiency. The Rego 850 series valve handwheel clears the outlet by plenty. A longer, maintenance-free life is insured by nylon packing, and automatic take-up which never requires adjustment. There's a choice of outlets and inlets for this UL listed valve.

Circle No. 239 on Reader Service Card.

Helmet Stays Put

A new welding helmet developed by Auto-View Welding Helmet Co. stays put while the operator inspects his work. A protective eye guard, controlled by the operator's jaw, lifts out of the way leaving a clear plastic window for viewing. This eliminates lifting of the helmet, improves work quality, and increases production. It is ideal for restricted area welding.

The helmet, of strong, fiber construction, is adjustable and has a very high safety factor.

Circle No. 240 on Reader Service Card.

Thread-Miller

Welding fabricators often need threading equipment. A new, portable self-powered unit developed by Fen-Thread-Machine Co. cuts stainless steel, beryllium, titanium without distortion or rip in one pass. Called Fen-Thread-Miller, attachment fits any screw-cutting engine lathe, which serves only to set pitch and root diameter. It has a 1/3-hp motor, sets up in five minutes, cuts any 60°, Acme, square or multiple threads in metal or plastic to 0.001 inch tolerance.

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Job Report Courtesy of
Leader Iron Works, Inc., Decatur, Ill.

For peace of mind
on any stainless welding job

This vacuum separator, made of 5/16" Type 316 stainless steel, is designed for 100 psi test pressure. To assure *predictable* results, Arcos Chromend KMo Electrodes (Type 316) were selected for a *combination* of top physical, metallurgical and chemical properties. For maximum benefits in welding stainless—consistent quality, low cost weld metal, and reliability in service —you can count on ARCOS.

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Linde

UNION CARBIDE

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Circle No. 91 on Reader Service Card.

Arcwire Expands Mt. Carmel Plant

MT. CARMEL, PA.: Arcwire Corporation is enlarging its plant here to supply the growing needs of the aluminum products industries for welding wire. A subsidiary of Arcos Corporation, Arcwire also draws welding quality stainless steel wire.

Muskegon Distributor Holds Welding Show

MUSKEGON, MICH.: A welding show and open house will be held on June 22 and 23 at the new store and warehouse of Lake Welding Supply Co. Hours are from 2 to 9 pm each day.

Victor Equipment Acquires L&B Welding

SAN FRANCISCO: Victor Equipment Co. has acquired L&B Welding, Inc., Berkeley, California, manufacturer of machines for the rebuilding of tractor track rollers, idlers and rails, announces L. W. Stettner, Victor president.

The new acquisition will be operated as a wholly-owned subsidiary, with manufacture to continue at the present Berkeley plant. Turner G. Brashear, Forest Leader, and Clifford Leader will remain in management capacities.

Anderson Heads NWSA

CHICAGO: V. B. Anderson of V. B. Anderson Co., Santa Ana, California, was elected president of the National Welding Supply Association at that group's 16th annual convention here last month.

Complete details on the convention will appear in our July issue.

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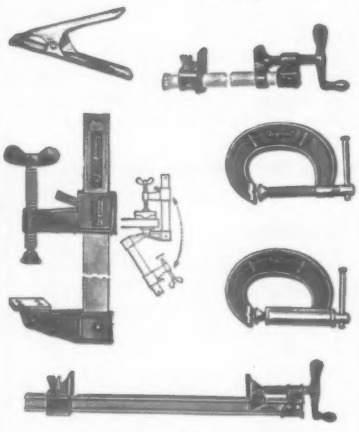

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MORT CLARK'S **GALV-WELD** ALLOY ORIGINAL & GENUINE

WAS BORN

The Navy didn't believe, tested it 3384 hours in salt spray (100 hours is normal), then approved it. Westinghouse reports Galv-Weld roof sign, installed 1936—still perfect in 1959—23 YEARS LATER!

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WHY EXPERIMENT?

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Eliminates corrosion areas produced by welding, so that weld will stand up under paint, WITHOUT rust, as on ornamental iron. Simply use residual heat from welding, or reheat, wire brush, and apply. No fluxing—No fumes.

Makes every welder a galvanizer of small weldments or parts. Repairs chipped porcelain, rusted appliances, rusted auto, truck or trailer bodies, frames, fenders, or other steel products. Can be readily refinished to match surrounding surface.

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RWMA *continued*

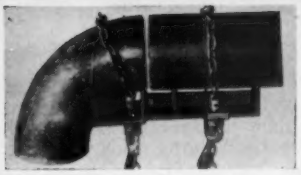
closely with the National Electrical Manufacturers' Association in the development of standards for resistance welding controls. In addition, the Association has accepted sponsorship of American Standards Association Sectional Committee C88, Resistance Welding Machines, for the purpose of developing American standards for Resistance Welding Machines, Controls and Electrodes and Electrode Holders.

Inquiries of a technical nature submitted to the Association are referred to the Technical Committee for consideration and advice.

RWMA considers the furtherance of technical, educational and research activities as one of its primary endeavors. Year after year, member companies budget a considerable fund to underwrite this phase of its activities. Over the years, many thousands of dollars have been appropriated for various research projects. With this field of activity being of such importance, it is anticipated that our work and support will not only continue, but undoubtedly increase.

Circle No. 49 on Reader Service Card.

SEE **JEWEL** FOR . . .



The JEWEL Elbow Clamp lines up welding elbows from 2½" to 8" at right angles to the pipe and holds them until tacked.

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The Bateman "Bantam" cuts 2" x 2" x ¼" angles and ¼" x 4" flats. Standard punches will fit this machine. The Coper will cope 1¼" through ⅛" material. It will punch ½" hole through ¼" material. With the clutch open, the Bantam will make 44 strokes per minute. It is made of high-grade cast iron, with the clutch, pin and dog made of hardened steel. The blades are made with tool steel. It is powered with a fly wheel and gear drive, and uses a small ¾ hp motor, 1750 rpm.

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Shipping wt. 750 lbs.

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uses CADDY

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